



Oil and Gas Production Optimization Courses Catalogue

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Customized to Your Needs

Every course in this catalogue can be customized. Content, depth and length are adjusted to your assets, your audience and your schedule, and your own field data and software can be built into the class. Courses are offered in person or virtually, in house or as public sessions.



Artificial Lift and Production Optimization

2.5-4 Days
20-32 Hours

Competence level:
Beginner to
Intermediate



In-Person or
Virtual Course

Course Description

Artificial lift systems are an important part of production operations for the entire lifecycle of an asset. Often oil and gas wells require artificial lift for most of the life cycle. Efficient and cost-effective production workflows involve field management using digital oilfield concepts. Understanding of these important production concepts is a must in order to profitably exploit existing assets to the fullest extent.

Learning Outcomes

- Gain an awareness of the fundamentals of production by being introduced to fluid flow, flow correlations, PVT/black oil, and the inflow performance relationship (IPR), vertical lift performance (VLP), nodal analysis, and pressure gradient curves.
- Be introduced to applications of major forms of artificial lift:
 - In-person: gas-lift (GL), reciprocating rod lift (RRL), electrical submersible pumping (ESP), progressing cavity pumping (PCP), hydraulic jet and piston pump (HJP), plunger and capillary injection.
 - Virtual: gas-lift (GL), reciprocating rod lift (RRL), and electrical submersible pumping (ESP).
- Gain knowledge of the entire lift system, from downhole to the surface, and the relevant components for:
 - In-person: GL, RRL, ESP, PCP, HJP, and plunger.
 - Virtual: GL, RRL, and ESP.
- Understand the challenges facing lift applications, particularly in unconventional fields, and how digital oilfield tools help address these challenges. Artificial lift selection and life cycle analysis are covered. Recent advances in real-time approaches to production monitoring and lift management are also discussed using field case studies.

Who Should Attend

- Production, reservoir, completion, drilling and facilities engineers and operators interested in learning about selection, design, analysis and optimum operation of artificial lift and related production systems will benefit from this course.

Prerequisites

- Understanding of basic petroleum engineering concepts. Attendees should have a petroleum engineering background or at least five years of working experience in the industry.

Course Content

- Module 1: Production Systems Analysis and Gas-Lift
 - Pre-test (in-person only)
 - Systems or Nodal Analysis: Multiphase flow, PVT properties, Inflow and Outflow Performance



- Artificial Lift Systems Classification: What, Why, How
- Continuous Gas-lift: Applications, Benefit/Limitations, Components, Design example, Optimization
- Module 2: Reciprocating Rod Lift
 - Applications, Benefit/Limitations, Components
 - Dynamometer cards and automation
 - Design example and optimization
- Module 3: Electrical Submersible Pumping
 - Applications, Benefit/Limitations, Components
 - Well Performance Curve and Design considerations, Example
 - Automation
- Module 4 (in-person only): Progressing Cavity Pumping, Hydraulic Jet and Piston Pumps
 - Applications, Benefit/Limitations, Components
 - Well Performance Curve and Design considerations, Example
- Module 5 (in-person only): Gas Well Deliquification, Capillary, Plunger Lift, Digital Oil Field
 - Gas Well Deliquification Problem
 - Capillary and plunger lift solutions for well deliquification
- Module 6 (in-person; numbered Module 4 in the virtual course): Unconventional Considerations and Digital Oilfield
 - Why and how is it different in unconventional production?
 - Special artificial lift selection: lift life-cycle and lift changeovers (in-person only)
 - Digital oil field and production optimization; Real-time downhole and surface measurements; Role of software in visualization, analysis and surveillance
 - Post-test (in-person only)

Format and Duration

- In-person: 4 days / 32 hours. Covers six modules, including PCP, hydraulic jet and piston pumps, gas well deliquification, capillary and plunger lift, and lift life-cycle and changeovers; includes a pre-test and post-test.
- Virtual: 2.5 days / 20 hours. Covers four modules focused on GL, RRL, ESP, and unconventional considerations and the digital oilfield.

Customize This Course

Every course in this catalogue is a starting point. Content, depth and length are adjusted to your assets, your audience and your schedule.

- Depth and length: shorter or longer, from a focused one-day session to a multi-day program, pitched at the skill level of your team.
- Focus: emphasize the lift methods, well types and topics that matter for your assets, for example gas-lift only, ESP only, or unconventional wells.
- Your data and software: optionally work with your own field data and the software available in your company. This needs advance preparation with the instructor and access to your data and software before the class.



- Delivery: in person at your site or a venue of your choice, or virtual, in full days or half-day sessions.



Nodal Analysis in Self-flowing and Artificial Lift Wells

5 Days or
40 Hours

Competence level:
Beginner to
Intermediate



In-Person or
Virtual Course

Course Description

Dynamics of oil and gas production wells require that decisions related to oil and gas producing installations be made after a thorough analysis of many inputs and many more production scenarios. NODAL™ analysis, also referred to as production system analysis, is an important technique that offers a toolset to determine the optimum combination of wellbore and surface system parameters under varying production conditions.

This five-day course aims to provide an essential discussion of NODAL analysis for naturally flowing oil and gas wells and artificially lifted wells. Using a combination of lectures and classroom exercises, we introduce participants to the theories underlying this vital technique. Once students understand the building blocks, combinatorial scenarios are introduced and solved to help students understand the interaction of various system parameters.

Learning Outcomes

- Learn the fundamentals of oil and gas production, such as:
 - Black oil characteristics and the importance of PVT properties
 - Multi-phase fluid flow behavior and patterns, multi-phase fluid flow correlations and unified mechanistic models
 - Reservoir behavior, or the inflow performance relationship (IPR)
 - Vertical lift performance (VLP) and pressure-gradient curves
- Combine the above concepts, leading to NODAL analysis concepts such as:
 - Selection of optimum completion
 - When will a gas or oil well not flow naturally?
- Apply NODAL analysis for artificial lift scenarios

Who Should Attend

- Production, reservoir, completion, drilling, and facilities engineers, analysts, and operators
- Anyone interested in learning about the application of NODAL analysis to well design and operational decisions, and their effect on profitability

Prerequisites

- Understanding of petroleum production concepts.

Course Content

- Pre-test
- Production Basics
 - The objectives, and the main challenges to achieve these objectives
 - Why is designing in a piece-meal fashion not the most effective approach?
- NODAL Analysis or Systems Analysis



- What is it?
 - What do we need to perform NODAL analysis?
- Single and Multi-Phase Flow Basics
 - Why multiphase flow?
 - Flow structures/patterns
 - Flow correlation categories
 - Mechanistic model
- PVT Basics
 - Black oil model or compositional?
 - Review of black oil models
 - Example calculations
- Inflow Performance Relationship
 - Basic concepts
 - The Productivity Index model
 - IPR relationships (class problems)
 - Vogel's IPR correlation
 - Fetkovich's method
- Flow through Restrictions
 - Critical flow correlations
 - General calculation models, well performance
- Well Performance
 - Inflow performance
 - Outflow performance
 - System equilibrium at mid-perf depth, wellhead
 - Parameters influencing inflow and outflow performance
 - Design examples considering multiple combinations of parameters
- NODAL Analysis of Continuous Flow Gas Lifted Wells
 - Basics of continuous flow gas lift design (class problems)
 - The effects of operational parameters
 - NODAL analysis of system performance

Format and Duration

- Duration: 5 days for in-person instruction, or 40 hours in virtual sessions.
- Software: PROSPER or SNAP and QROD software packages are used to demonstrate the effective use of NODAL analysis.
- Client option: the client may provide another software package and their datasets. A workshop is then conducted to provide hands-on exposure to how NODAL analysis is performed in that software package and what workflow engineers can use to get maximum benefit. This requires three days of consulting work and a license for the client's software at least 4 weeks prior to the class.



Customize This Course

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- Depth and length: shorter or longer, from a focused one-day session to a multi-day program, pitched at the skill level of your team.
- Focus: emphasize the lift methods, well types and topics that matter for your assets, for example gas-lift only, ESP only, or unconventional wells.
- Your data and software: optionally work with your own field data and the software available in your company. This needs advance preparation with the instructor and access to your data and software before the class.
- Delivery: in person at your site or a venue of your choice, or virtual, in full days or half-day sessions.



Data Analytics Workflows for Artificial Lift, Production and Facility Engineers

2 Days or
16 Hours

Competence level:
Intermediate



In-Person or
Virtual Course

Course Description

Business impact: the main aim is to provide insight and understanding of data analytics and machine learning principles through applications. Field data is used to explain data-analysis workflows. Using easy-to-follow solution scripts, participants assess and extract value from the data sets. The hands-on solution approach gives them confidence to try out applicable techniques on data from their field assets.

Data analysis means cleaning, inspecting, transforming and modeling data with the goal of discovering new, useful information and supporting decision-making. In this hands-on course, participants learn data analysis and data science techniques and workflows applied to petroleum production (specifically artificial lift) while reviewing code and practicing. The focus is on developing data-driven models while keeping close to the underlying oil and gas production principles.

Specifically, the following use cases are discussed, covering their business impact, code walkthroughs and solutions:

- Gas-lift optimization: single-point gas-lift injection for gas wells in tight formation using simulated data
- Choke flow rate estimation for high-volume wells using an offshore dataset
- Rod pump diagnosis (card classification) using onshore field data
- Flow pattern prediction and slug catcher design using a laboratory dataset
- Liquid loading in gas wells using a laboratory dataset
- Virtual flow meter using an ESP dataset
- Multiphase flow meter prediction using a three-phase measured dataset
- Gas-lift multi-well optimization: discussion only

Learning Outcomes

- After completing the course, participants will have a set of tools and some pathways to model and analyze their data in the cloud, find trends, and develop data-driven models.

Who Should Attend

This Intermediate level course is primarily intended for artificial lift, production and facilities engineers and students to enhance their knowledge base, increase technology awareness, and improve facility with different data analysis techniques applied to large data sets.

Prerequisites

- Understanding of petroleum production concepts
- Knowledge of Python is not a must but is preferred to get the full benefit
- The Google Colaboratory environment, available in Google Cloud, is used for hands-on exercises



- Trainees need to bring a computer with a Google Chrome browser and a Google email account (available for free)

Course Content

1. Digital Oil Field Data Explorations/Workflows
 1. Digital Transformation and Oilfields
 2. Key technologies for digital oilfields
 3. Oilfield System Data Verification and Management
2. A Brief/Incomplete Primer on ML/AI
 1. Data Science versus Data Analytics
 2. AI, ML and Deep Learning
 3. Data Analytics Lifecycle
 4. Bias-Variance-Complexity Tradeoff
 5. Data Preparation
 6. Model Types
 7. Role of Domain Knowledge
 8. Training and Evaluating Model
 9. Toolsets
3. System Setup & Checks
 1. Google CoLab: why do we need it?
 2. Pull datasets and codebase from the GitHub repository
 4. Data Workflows & Best Practices in Exploratory Data Analysis
 1. Data types in the production domain: streaming (real-time or time-series) vs. static (non-streaming)
 2. Data processing challenges
 3. Data basics: cleaning, filtration and regulation
 4. Best practices in exploratory data analysis
 5. Rod Pump Dynamometer Card Classification (brief description of the data set/problem use case and expected outcome)
 1. The problem, input and output variables definition (SPE paper)
 2. Data set
 3. Hands-on exercise: model development and testing
 6. Flow Pattern Prediction (brief description of the data set/problem use case and expected outcome)
 1. Problem, input and output variables definition



2. Data set
3. Hands-on exercise: model development and testing
7. Gas Lift Slugging (brief description of the data set/problem use case and expected outcome)
 1. Problem, input and output variables
 2. Hands-on exercise: regression solution
8. Choke Flow Rate Study (brief description of the data set/problem use case and expected outcome)
 1. Problem, input and output variables
 2. Hands-on exercise: multiple ML models and comparison
9. Multiphase Flow Meter (brief description of the data set/problem use case and expected outcome)
 1. Problem, input and output variables (SPE paper)
 2. Hands-on exercise: multiple ML models and comparison
10. Virtual Flow Meter with ESP Data Set (time permitting)
 1. The problem, dataset: inputs/outputs
 2. Two or three ML solutions

Format and Duration

- Level: Intermediate. Two days (16 hours), in person or virtual.
- The course content is for two days in the classroom or four virtual half-day sessions. The training can also be presented as a 1-day or two half-day virtual sessions.
- Training method: the course can be taught virtually or in the classroom. It discusses several business use cases that are amenable to data-driven workflows. For each use case, the instructor shows the solution using a data analysis technique with Python code deployed in Google Cloud. Trainees solve a problem and tweak their solution.
- The course can be customized to focus on specific artificial lift methods, e.g., gas-lift or ESP only.
- Client dataset-based examples are optionally incorporated in the class discussions. This option requires discussions with the client about the problem, two days of consulting effort, and access to the client dataset at least 4 weeks before the class.
- Software: Python code in Google Colaboratory (Google Cloud); datasets and code pulled from a GitHub repository.

Customize This Course

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- Depth and length: shorter or longer, from a focused one-day session to a multi-day program, pitched at the skill level of your team.
- Focus: emphasize the lift methods, well types and topics that matter for your assets, for example gas-lift only, ESP only, or unconventional wells.



- Your data and software: optionally work with your own field data and the software available in your company. This needs advance preparation with the instructor and access to your data and software before the class.
- Delivery: in person at your site or a venue of your choice, or virtual, in full days or half-day sessions.



Surveillance, Optimization, Data Analytics and Machine Learning for ESP Engineers

1 Day or
8 Hours

Competence level:
Intermediate



In-Person or
Virtual Course

Course Description

Business impact: this course/workshop aims to give an understanding of surveillance, data analytics and machine learning principles as they relate to ESP wells through practical applications. Field data is employed to clarify workflows related to surveillance, optimization and data analysis. Participants assess and extract value from the data sets with the help of easy-to-follow solution scripts. The practical, hands-on approach enables them to confidently test these techniques on their ESP well data.

To ensure profitable ESP well operation with minimal NPT and failure rates, robust surveillance and optimization are crucial. Real-time data streams from heavily instrumented ESP wells can be challenging to manage with traditional methods. The course bridges gaps by using data analytics and machine learning approaches facilitated by generative AI. In this hands-on course, participants learn about surveillance, optimization, data analysis and data science techniques and workflows applied to ESP wells while reviewing code and practicing. The focus is on developing data-driven models while keeping close to the underlying oil and gas production principles.

The following use cases are discussed, covering their business impact, code walkthroughs and solutions:

- ESP state identification
- Virtual flow meter
- Choke flow rate estimation for high-volume wells using an offshore dataset
- Reservoir productivity assessment for unconventional wells
- ESP failure analysis and prediction

Learning Outcomes

- After completing the course, participants will have a set of tools and some pathways to model and analyze their ESP wells' data in the cloud, find trends, and develop data-driven models.

Who Should Attend

This Intermediate level course is primarily intended for artificial lift, production and facilities engineers and students to enhance their knowledge base, increase technology awareness, and improve facility with different data analysis techniques applied to large data sets.

Prerequisites

- Understanding of petroleum production concepts and specifically ESP design and operations
- Knowledge of Python is not a must but is preferred to get the full benefit
- Trainees need to bring a computer with a Google Chrome or Edge browser and a Google email account (available for free). The Google Colaboratory environment, available in Google Cloud, is used for hands-on exercises.



Course Content

- Digital Oilfield
 - Digital transformation and oilfields
 - Key technologies for digital oilfields
 - Oilfield system data verification and management
- Digitalization in ESP and production optimization
 - ESP surveillance approaches
 - Optimization approaches
 - AI/ML-infused ESP management
- Data types in the production domain: streaming (real-time or time-series) vs. static (non-streaming)
 - Data processing challenges
 - Data basics: cleaning, filtration and regulation
 - Best practices on data exploratory analysis
- AI, ML and Deep Learning: brief and incomplete primer
 - Data analytics lifecycle
 - Bias-variance-complexity tradeoff
 - Data preparation
 - Model types
 - Role of domain knowledge
 - Training and evaluating model
 - Toolsets
- System setup and checks
 - Google CoLab: why do we need it?
 - Pull datasets and codebase from the GitHub repository
- Case studies
 - Problem statement
 - Data requirement
 - Using generative AI in Colab
 - Case study 1: ESP state identification with downhole data / gradient curve predictions
 - Case study 2: VFM using catalog curves (PDP pip)
 - Case study 3: VFM with pressure drop across tubing (PDP to WHPf)
 - Case study 4: reservoir productivity assessment for unconventional well
 - Case study 5: ESP failure analysis approaches

Format and Duration

- Level: Intermediate. One day (8 hours), in person or virtual.
- Training method: the course can be taught virtually, though the best experience and results are achieved through mutual interaction in a classroom setting, which is also conducive to workshop-type outcomes due to increased interaction. For each use case, the instructor shows the solution using a data analysis technique, with the Python code deployed in Google Cloud. Trainees solve a problem and tweak their solution.



- The training can be extended to 2 days or four half-day virtual sessions. The extended option includes five additional use cases.
- Client dataset-based examples are optionally incorporated in the class discussions. This option requires discussions with the client about the problem, two days of consulting effort, and access to the client dataset at least 4 weeks before the class.
- Software: Python code in Google Colaboratory (Google Cloud), with generative AI in Colab; datasets and code pulled from a GitHub repository.

Customize This Course

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- Depth and length: shorter or longer, from a focused one-day session to a multi-day program, pitched at the skill level of your team.
- Focus: emphasize the lift methods, well types and topics that matter for your assets, for example gas-lift only, ESP only, or unconventional wells.
- Your data and software: optionally work with your own field data and the software available in your company. This needs advance preparation with the instructor and access to your data and software before the class.
- Delivery: in person at your site or a venue of your choice, or virtual, in full days or half-day sessions.



Surveillance, Optimization, Data Analytics and Machine Learning for Gas Lift Engineers

1 Day or
8 Hours

Competence level:
Intermediate



In-Person or
Virtual Course

Course Description

Business impact: this course/workshop aims to give an understanding of surveillance, data analytics and machine learning workflows as they relate to gas lift wells through practical applications. Field data is employed to clarify workflows related to surveillance, optimization and data analysis. Participants assess and extract value from the data sets with the help of easy-to-follow solution scripts. The practical, hands-on approach enables them to confidently test these techniques on their naturally flowing and gas lifted wells' data.

To ensure profitable gas lift wells with minimal NPT and failure rates, robust surveillance and optimization are crucial. Real-time data streams from gas lift wells can be challenging to manage with traditional methods. The course bridges gaps by using data analytics and machine learning approaches facilitated by generative AI. In this hands-on course, participants learn about surveillance, optimization, data analysis and data science techniques and workflows applied to gas lift wells while reviewing code and practicing. The focus is on developing data-driven models while keeping close to the underlying oil and gas production principles.

The following use cases are discussed, covering their business impact, code walkthroughs and solutions:

- Gas lift well state identification
- Virtual flow meters
- Single-point gas lift
- Reservoir productivity assessment for unconventional wells

Learning Outcomes

- After completing the course, participants will have a set of tools and some pathways to model and analyze their naturally flowing and gas lift wells' data in the cloud, find trends, and develop data-driven models.

Who Should Attend

This Intermediate level course is primarily intended for artificial lift, production and facilities engineers and students to enhance their knowledge base, increase technology awareness, and improve facility with different data analysis techniques applied to large data sets.

Prerequisites

- Understanding of petroleum production concepts and specifically gas lift design and operations
- Knowledge of Python is not a must but is preferred to get the full benefit
- Trainees need to bring a computer with a Google Chrome or Edge browser and a Google email account (available for free). The Google Colaboratory environment, available in Google Cloud, is used for hands-on exercises.



Course Content

- Digital Oilfield
 - Digital transformation and oilfields
 - Key technologies for digital oilfields
 - Oilfield system data verification and management
- Digitalization in Gas Lift and production optimization
 - Gas lift surveillance approaches
 - Optimization approaches
 - AI/ML-infused gas lift management
- Data types in the production domain: streaming (real-time or time-series) vs. static (non-streaming)
 - Data processing challenges
 - Data basics: cleaning, filtration and regulation
 - Best practices on data exploration analysis
- AI, ML and Deep Learning: brief and incomplete primer
 - Data analytics lifecycle
 - Bias-variance-complexity tradeoff
 - Data preparation
 - Model types
 - Role of domain knowledge
 - Training and evaluating model
 - Toolsets
- System setup and checks
 - Google CoLab: why do we need it?
 - Pull datasets and codebase from the GitHub repository
- Case studies
 - Problem statement
 - Data requirement
 - Using generative AI in Colab
 - Case study 1: Gas Lift state identification with downhole data / gradient curve predictions
 - Case study 2: VFM using choke pressure drop from offshore gas lift asset
 - Optional: Case study 3: VFM with pressure drop across tubing (PDP to WHPf)
 - Case study 4: reservoir productivity assessment for unconventional well
 - Review Case study 5 (no hands-on): multi-well optimization from Alaska

Format and Duration

- Level: Intermediate. One day (8 hours), in person or virtual.
- Training method: the course can be taught virtually, though the best experience and results are achieved through mutual interaction in a classroom setting, which is also conducive to workshop-type outcomes due to increased interaction. For each use case, the instructor shows the solution using a data analysis technique, with the Python code deployed in Google Cloud. Trainees solve a problem and tweak their solution.



- Software: Python code in Google Colaboratory (Google Cloud), with generative AI in Colab; datasets and code pulled from a GitHub repository.

Customize This Course

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- Depth and length: shorter or longer, from a focused one-day session to a multi-day program, pitched at the skill level of your team.
- Focus: emphasize the lift methods, well types and topics that matter for your assets, for example gas-lift only, ESP only, or unconventional wells.
- Your data and software: optionally work with your own field data and the software available in your company. This needs advance preparation with the instructor and access to your data and software before the class.
- Delivery: in person at your site or a venue of your choice, or virtual, in full days or half-day sessions.



Artificial Lift and Optimization for Unconventional Assets

3 Days or
24 Hours

Competence level:
Intermediate



In-Person or
Virtual Course

Course Description

This course is designed to give trainees an overview of artificial lift and related issues that are applicable to unconventional and tight oil/gas wells. Production optimization is also discussed, particularly real-time measurements and optimization techniques that are required to understand and manage dynamic production scenarios.

Besides introducing participants to the basics of artificial lift and real-time measurements, the training focuses on specific production and lift challenges related to unconventional wells. Artificial lift selection and life cycle analysis are also covered. Recent advances in real-time approaches to production monitoring and lift management are discussed using field case studies. The course closes with a group exercise wherein each group of trainees develops a problem statement and solution plans for production from unconventional assets.

Unlike conventional production, unconventional production is highly dynamic in the short term as well as the medium to long term. As a result, traditional approaches to artificial lift applications are inefficient if not unsuccessful. The artificial lift life cycle is different for unconventional wells. Production dynamics requires us to rethink the application of real-time downhole and surface sensing. Software tools available to analyze field data are inadequate. This course will help trainees understand and appreciate these aspects while providing them applicable solution paths.

Who Should Attend

- Artificial lift and production personnel responsible for shale fields development and production
- Reservoir, completion, drilling and facilities engineers working on shale development
- Field and asset supervisors and managers interested in improving performance of their unconventional assets
- Anyone interested in learning about artificial lift and the unique challenges of unconventional production

Prerequisites

Understanding of petroleum production concepts. Attendees should have a petroleum engineering background or at least five years of working experience in the industry.

Course Content

- Day 1
 - Pre-test
 - Introduction to Artificial Lift Systems and Production Optimization: What, Why, How
 - Production Challenges specific to Shale Development
 - Continuous Gas-lift: Applications, Benefit/Limitations, Components, Design Considerations
 - Electrical Submersible Pumping: Applications, Benefit/Limitations, Components, Design considerations



- Hydraulic Jet and Piston Pump
- Day 2
 - Reciprocating Rod Lift: Applications, Benefit/Limitations, Components, Design considerations
 - Capillary Injection: Application for lift and chemical treatment, Components, Design considerations
 - Plunger Lift: Gas well deliquification, Components, Design considerations
 - Selection of artificial lift for Shale Wells
 - Variables specific to Shale Well ALS Selection
 - Strengths and weaknesses of applicable lift systems
- Day 3
 - Selection of artificial lift for Shale Wells
 - Lift Life Cycle and Elimination process
 - Application case studies in oil and gas wells
 - Digital oil field and production optimization
 - Real-time downhole and surface measurements
 - Role of software in visualization, analysis and surveillance
 - Application case studies
 - Lift Selection Aspects in Shale: Group Exercise

Format and Duration

- Duration: three days.
- The course closes with a group exercise in which each group develops a problem statement and solution plans for production from unconventional assets.

Customize This Course

Every course in this catalogue is a starting point. Content, depth and length are adjusted to your assets, your audience and your schedule.

- Depth and length: shorter or longer, from a focused one-day session to a multi-day program, pitched at the skill level of your team.
- Focus: emphasize the lift methods, well types and topics that matter for your assets, for example gas-lift only, ESP only, or unconventional wells.
- Your data and software: optionally work with your own field data and the software available in your company. This needs advance preparation with the instructor and access to your data and software before the class.
- Delivery: in person at your site or a venue of your choice, or virtual, in full days or half-day sessions.



Gas Lift Design & Optimization using NODAL Analysis

5 Days or
40 Hours

Competence level:
Intermediate



In-Person or
Virtual Course

Course Description

Gas-lift is one of the predominant forms of artificial lift used for lifting liquids from conventional, unconventional, onshore and offshore assets. Gas-lift and its various forms (intermittent lift, gas-assisted plunger lift) allow life-of-well lift possibilities when selected and applied properly. This course is designed to give trainees a thorough understanding of gas-lift technology and related application concepts. The course covers main components, application envelope, and the relative strengths and weaknesses of gas-lift and its different forms, such as intermittent lift and gas-assisted plunger lift. Trainees solve examples and class problems throughout the course. Animations and videos reinforce the concepts under discussion. A unique feature of this course is the discussion on digital oil field and machine learning applications in gas-lift optimization. PROSPER or SNAP and QROD software packages are used to demonstrate the effective use of NODAL analysis.

Learning Outcomes

- Understand the fundamental theories and procedures related to gas-lift operations.
- Easily recognize the different components of the gas-lift system and their basic structural and operational features.
- Be able to design a gas-lift installation.
- Understand how digital oilfield tools help address ESP challenges.
- Recent advances in real-time approaches to production monitoring and lift management.

Who Should Attend

- Production, reservoir, completion, drilling and facilities engineers, analysts, and operators
- Anyone interested in learning about implications of gas-lift systems for their fields and reservoirs.

Prerequisites

- Understanding of petroleum production concepts.

Course Content

Day 1

- Pre-test
- Introduction to Artificial Lift: When / Why / What of Lift Mechanisms; Types
- How gas-lift is the same as and different from other lift forms
- Well life cycles and gas-lift applicability vis-a-vis other lift methods
- Well Performance: Review of Fundamentals
 - Systems/NODAL Analysis
 - Reservoir Performance: Productivity Index & Inflow Performance Relationship (IPR)
 - PVT Analysis
 - Multiphase Flow



- Flow Correlations & Mechanistic models; Flow Regimes/maps
- Pressure Gradient Curves
- VLP: Vertical Lift Performance

Day 2: Gas-Lift

- Gas Lift Installation Types
- Tubing Flow Installations
 - Open Installation
 - Semi-Closed Installation
 - Closed Installation
 - Chamber Installations
- Casing Flow and Other Installations
- Gas Lift Valves
 - Gas Lift Valve Types
 - Supporting Calculations
 - Valve Construction Details
 - Valve Mechanics of IPO Valves (Class Problems)
 - Dynamic Performance of Gas Lift Valves
 - Setting of Gas Lift Valves
 - Application of Gas Lift Valves
 - Running and Retrieving Gas Lift Valves
- Continuous Flow Gas Lifting
 - Principles of Continuous Flow Gas Lifting

Day 3: Continuous Flow Designs

- Continuous Flow Gas Lifting
 - Principles of Continuous Flow Gas Lifting
 - Installation Design Calculations (Class Problems)
 - The Effects of Operational Parameters
 - Surface Gas Injection Control
- NODAL Analysis of Continuous Flow Gas Lifted Wells
 - Description of System Performance
 - Constant Wellhead Pressure Cases (Class Problems)
 - Unlimited & Limited Lift Gas Availability
 - The Equilibrium Curve Method (Class Problem)
 - Variable Wellhead Pressure Cases
 - System Stability
- Optimization of Continuous Flow Gas Lift Installations
 - Basic Principles
 - Optimization of a Single Well for Prescribed Liquid Rate
 - Existing Compressor (Class Problem)
 - Compressor to be Selected
 - Single-Well Optimization for Unlimited Rate



- The Economic Slope Method
 - Allocation of Lift Gas to a Group of Wells
 - The Equal Slope Method (Class Problem)
- CASE STUDY: Optimizing the Operating Conditions in a Major Gas-Lifted Field

Day 4: Unloading, Intermittent and Troubleshooting

- Unloading Design for Continuous Flow
 - Unloading Valve String Design
 - Valve String Designs (Class Problem)
- VIDEO Presentation: The Unloading Process
- Intermittent gas-lift basics & overview of design
 - Plunger Assisted Gas-lift & Gas-assisted Plunger Lift
- Analysis and Troubleshooting of Continuous Flow Gas Lift Wells
 - Troubleshooting Tools and their Use
 - Two-Pen Pressure Recordings
 - Downhole Pressure and Temperature Surveys
 - Acoustic Surveys
- Common Gas Lift Malfunctions
 - Downhole Problems
 - Distribution and Gathering System Problems

Day 5: Unconventional and Digital Transformation

- Gas Lift Application in Unconventional Production
- Digital Oil Field for Production Optimization
 - Production Optimization and Digital Oil Field (DOF)
 - Available Technologies
 - Downhole P/T Measurement Components
 - Surface Flow Measurement Components
 - Role of software in visualization, analysis and surveillance
- Brief discussion on use cases for data analytics
- Post-test

Format and Duration

- In person: 5 days. Virtual: spread over 40 hours of sessions.
- The course is customizable from one to five days in length for a variety of audiences at appropriate skill and knowledge levels. A concise curriculum is available for project and asset managers interested in expanding their understanding of the effects of artificial lift on the performance of their assets.
- Software: PROSPER or SNAP and QROD are used to demonstrate the effective use of NODAL analysis.
- Option: the client's real-time system-based workflows and examples can be incorporated in the class discussions. This requires two days of consulting and access to the client system at least 4 weeks before the class.



Customize This Course

Every course in this catalogue is a starting point. Content, depth and length are adjusted to your assets, your audience and your schedule.

- Depth and length: shorter or longer, from a focused one-day session to a multi-day program, pitched at the skill level of your team.
- Focus: emphasize the lift methods, well types and topics that matter for your assets, for example gas-lift only, ESP only, or unconventional wells.
- Your data and software: optionally work with your own field data and the software available in your company. This needs advance preparation with the instructor and access to your data and software before the class.
- Delivery: in person at your site or a venue of your choice, or virtual, in full days or half-day sessions.



Gas Lift Optimization in Unconventional

3 Days or
24 Hours

Competence level:
Beginner to
Intermediate



In-Person or
Virtual Course

Course Description

Almost all oil and gas wells require artificial lift at some point, and for most of the life cycle, to achieve production objectives. There are at least eight forms of artificial lift technologies available in the market. Each lift system's applicability often overlaps with other lift systems, and it is important to understand the positioning and strength of a particular lift form. Unlike mechanical forms of lift, gas-lift performance relies heavily on understanding the interdependency between reservoir, wellbore and surface installations. Gas-lift is one of the predominant forms of artificial lift used for lifting liquids from conventional, unconventional, onshore and offshore assets. Gas-lift and its various forms (intermittent lift, gas-assisted plunger lift) allow life-of-well lift possibilities when selected and applied properly. This course is designed to give trainees a thorough understanding of gas-lift technology and related application concepts in unconventional and tight oil and gas wells. Related production optimization topics are also discussed.

This course focuses on gas-lift applications and related system analysis (often called NODAL analysis) concepts. While providing instruction at an intermediate level, the training will arm attendees with sufficient detail to participate in the informed decision-making process.

Learning Outcomes

- Provide a thorough introduction to the theory of gas lift.
- Demonstrate the advantages and limitations of gas-lift systems.
- Acquaint the student with system evaluation, design, installation and operation concepts.
- Why gas-lift is important for unconventional production and what it competes against.
- Components and application envelope for gas-lift.
- Forms of gas-lift applied successfully in unconventional fields.
- Production optimization of gas-lift installations.

Who Should Attend

- Production, reservoir, completion, drilling and facilities engineers
- Anyone interested in learning about application of gas-lift systems for unconventional reservoirs.

Prerequisites

- Understanding of petroleum production concepts.

Course Content

- Introduction
 - Artificial Lift: When / Why / What of Lift Mechanisms; Types
 - How gas-lift is the same as and different from other lift forms. Relative market position.
- Well Performance: Review of Fundamentals
 - Systems/NODAL Analysis



- Reservoir Performance: Productivity Index & Inflow Performance Relationship (IPR)
- PVT Analysis
- Multiphase Flow
 - Flow Correlations & Mechanistic models; Flow Regimes/maps
 - Pressure Gradient Curves
 - VLP: Vertical Lift Performance
- Gas-Lift
 - Types; Application; Advantages, Limitations
 - Equipment: Downhole & Surface
 - Gas-Lift production rate & well evaluation basics: Operating Point Analysis
- Gas-Lift Valve Mechanics
 - Valve Classifications: IPO, PPO, Pilot, Dummy
 - Continuous Flow Unloading Sequence
 - Force Balance Theory for IPO & PPO Valves
 - Importance of True Valve Performance
- Gas-Lift Installation Design
 - Overview of IPO design methodology; Valve Spacing & Valve Sizing
- Design & Optimization
 - Artificial Lift lifecycle and what comes next in an unconventional well's life cycle
 - Intermittent gas-lift basics & overview of design
 - Plunger lift & Gas-assisted Plunger lift
 - Injection Infrastructure: Compression & sizing
 - Single Well Optimization Concepts
 - Digital oilfield concepts applicable to gas-lift

Format and Duration

- Course duration: three days.

Customize This Course

Every course in this catalogue is a starting point. Content, depth and length are adjusted to your assets, your audience and your schedule.

- Depth and length: shorter or longer, from a focused one-day session to a multi-day program, pitched at the skill level of your team.
- Focus: emphasize the lift methods, well types and topics that matter for your assets, for example gas-lift only, ESP only, or unconventional wells.
- Your data and software: optionally work with your own field data and the software available in your company. This needs advance preparation with the instructor and access to your data and software before the class.
- Delivery: in person at your site or a venue of your choice, or virtual, in full days or half-day sessions.



Advanced Sucker Rod Pumping

3-5 Days
24-40 Hours

Competence level:
Intermediate to
Advanced



In-Person or
Virtual Course

Course Description

This course covers one of the most common artificial lift methods, Sucker Rod Pumping (SRP), also known as beam pumping or reciprocating rod lift (RRL). It introduces participants to important concepts of sucker rod pumping and teaches beam pumping system components from the downhole to the surface, including the real-time optimization infrastructure. It covers the challenges facing reciprocating rod lift applications and presents how these challenges are addressed. Special well conditions such as high-viscosity fluids, free gas production and abrasive materials require special equipment, which is covered during the course. Trainees solve examples and class problems throughout, illustrated with classroom examples and hands-on exercises. Animations and videos reinforce the concepts under discussion. The special feature of the course is a discussion of digital oilfield and a brief review of machine learning applications in the operations of RRL. Recent advances in real-time approaches to rod lift management are also discussed using field case studies.

The course is also offered with an emphasis on unconventional wells. Business impact: the main aim is to explain how operators are using sucker rod pumping profitably in unconventional reservoirs. Discussions on field practices expose trainees to current practices, and interactive quizzes and hands-on exercises give them the confidence to try out applicable techniques in their field assets to reduce NPT and increase profitability. That variant introduces important unconventional concepts of sucker rod pumping, illustrated with field case studies, covers the beam pumping system components briefly, and presents how the challenges facing RRL are addressed in unconventional production.

Learning Outcomes

- Understand the fundamental theories and procedures related to SRP operations.
- Easily recognize the different components of the SRP system and their basic structural and operational features.
- Be able to design an SRP installation and select the optimum components.
- Have a basic understanding of the SRP system's power efficiency and system losses.
- Be able to conduct basic troubleshooting of SRP installations.
- Understand how digital oilfield tools help address SRP challenges.
- Recent advances in real-time approaches to production monitoring and lift management.

Additional outcomes for the unconventional-wells emphasis:

- Understand differences in unconventional reservoirs that impact production and artificial lift choices.
- Understand how SRP is challenged in unconventional wells and how other companies are addressing some of these challenges.
- Recent advances in real-time approaches to production monitoring and lift management of rod pumping wells in unconventional plays.



Who Should Attend

- Production, reservoir, completion, drilling and facilities engineers, analysts, and operators
- Anyone interested in learning about the implications of sucker rod pumping systems for their fields and reservoirs.

Prerequisites

- Understanding of petroleum production concepts.
- Basic understanding of sucker rod pumping (stated for the unconventional-wells emphasis).

Course Content

Core course

- Pre-test
- Introduction
 - Artificial Lift: When / Why / What of Lift Mechanisms; Types
 - How SRP is the same as and different from other lift forms. Relative market position.
- Introduction to Sucker-Rod Pumping
 - Basic Features of Sucker-Rod Pumping
 - Advantages, Limitations
- The Components of the Sucker-Rod Pumping System
 - Subsurface Pumps
 - API and Special Pumps
 - Downhole Gas Separators
- The Sucker-Rod String
 - Sucker-Rod Specifications: Steel and Fiberglass Rods
 - Special Types of Sucker Rods: Corods, etc.
 - Rod String Design Theories (Class Problems)
 - Example Rod String Design Calculations (Class Problems)
 - SPECIAL PRESENTATION: Identification and Classification of Rod String Failures
- The Sucker-Rod Pumping Unit
 - API and Non-API Pumping Units: Geometries Comparison
 - Kinematic Calculations (Class Problems)
- Pumping System Design with API RP 11L Procedure
 - Introduction (Class Problem)
 - Design Procedure for Steel Rod Strings (Class Problem)
- Production Rate Calculations
 - Pump Displacement
 - Pump Leakage (Class Problem)
- Calculation of Gearbox Torques
 - Torques on the Gear Reducer
 - Analysis of Gearbox Torques
 - Optimum Counterbalancing
 - Practical Torque Calculations (Class Problems)



- SPECIAL PRESENTATION: Gearbox Torques Calculations
- Power Conditions of Sucker-Rod Pumping
 - Hydraulic Power Calculations (Class Problem)
 - System Energy Losses
 - Power Efficiency of Rod Pumping
 - CASE STUDY: Comparison of Energy Efficiencies of Rod Pumping and ESP
- Design of the Sucker Rod Pumping System using QRod
- Analysis and Troubleshooting of Sucker Rod Pumped Installations
 - Well Testing
 - Acoustic Surveys
 - Bottomhole Pressure Calculations
 - Inflow Performance Calculations (Class Problem)
 - Principles of Dynamometry
 - Dynamometer Types
 - Dynamometer Surveys
 - Interpretation of Dynamometer Cards
- SRP Challenges in Unconventional Production
- Digital Oil Field for Production Optimization
 - What is Production Optimization and Digital Oil Field (DOF)?
 - DOF components for SRP systems
 - Rod Pump Controller & Variable Speed Drive Controllers
 - Real-Time Downhole & Surface Measurements and Role of Data Analytics
 - Available Technologies
 - Role of software in visualization, analysis and surveillance
 - Brief discussion on use cases for data analytics
- Post-test

Unconventional-wells emphasis (content additional to the core outline)

The content can be adjusted to suit client preferences. Topics shared with the core outline (pre-test, introduction to artificial lift, SRP basics and components, QRod design, dynamometer cards, acoustic surveys, rod failure identification and classification, DOF components, rod pump and VSD controllers, data analytics) are also part of this variant.

- Production Challenges specific to Shale Development
- Selection of artificial lift for Shale Wells
 - Important Play Characteristics to Understand ALS Strategy
 - Installation Timing / Practices
 - Case Study: Effect of Change of EOT (Lowering Tubing)
 - Case Study: Effect of Condensate Properties
- Lift Life Cycle and Elimination process
- Sucker Rod Pumping Design & Operations Considerations
 - Case Study: Rod Design & Guiding Strategy
 - High Temperature Impact on Rod Guides



- Downhole Gas Interference Management
 - Case Study: Downhole Separator for ESP & Rod Pumping Wells
- Corrosion Mitigation Considerations
 - Case Study: Data Driven Automated Batch Treatment Program
- Production Monitoring best practices
- Unconventional Well Production Automation & Unmanned Technologies
 - VSD Application for Inflow Variability, Gas Interference and Solids Management in SRP Wells (Case Study)
 - Choke Control and scale control using Solar Powered Technology
 - Application of Edge Controller for Pump Stroke Optimization in Eagle Ford Wells
- Optional: Data Analytics Application
 - Demonstration: Dynacard classification using ML/AI approaches
- Optional: Frac-Hit Mitigation for Sucker Rod Pumping

Format and Duration

- General emphasis: design of the SRP system is demonstrated using QRod.
- Core course option: the client's real-time system-based workflows and examples can be incorporated in the class discussions. This requires two days of consulting and access to the client system at least 4 weeks before the class.
- Unconventional-wells emphasis: 3 days in person, or 24 hours in virtual sessions spread over multiple days or weeks. Level: Intermediate to Advanced.
- Unconventional-wells emphasis customization: the content can be shortened to a 1-day or 2-day in-person event, with equivalent virtual sessions arranged per the client's preference. The content can be adjusted to suit client preferences.

Customize This Course

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- Depth and length: shorter or longer, from a focused one-day session to a multi-day program, pitched at the skill level of your team.
- Focus: emphasize the lift methods, well types and topics that matter for your assets, for example gas-lift only, ESP only, or unconventional wells.
- Your data and software: optionally work with your own field data and the software available in your company. This needs advance preparation with the instructor and access to your data and software before the class.
- Delivery: in person at your site or a venue of your choice, or virtual, in full days or half-day sessions.



Electrical Submersible Pumping: Design, NODAL Analysis and Advanced Applications

5 Days or
40 Hours

Competence level:
Intermediate to
Advanced



In-Person or
Virtual Course

Course Description

ESP is one of the predominant forms of artificial lift used for lifting prolific quantities of liquids from conventional, unconventional, onshore, and offshore assets. Proper application of ESP is a must in any environment to improve the profitability of an oil-producing asset. ESP in its various configurations allows the life of well lift-possibilities when selected and applied correctly. This course gives trainees a thorough understanding of ESP artificial lift technology and related application concepts.

The course covers the basic design principles of one of the most common artificial lift methods, Electrical Submersible Pumping, illustrated with many classroom examples. The proper design of ESP installations is a technical and economic problem. The course starts with a short overview of fundamentals and deals with well inflow performance, hydraulics, electrics, and a basic description of NODAL Analysis principles. The basic components of the ESP system (the pump, motor, protector, and electric cable) are fully described by introducing their main structural and operational features. Trainees solve examples and class problems throughout the course. Animations and videos reinforce the concepts under discussion.

Most oil and gas wells require artificial lift at some point and for most of the life cycle to achieve production objectives. There are at least eight forms of artificial lift technologies available in the market. Each lift system's applicability often overlaps with another lift system(s), and it is crucial to understand the positioning and strength of a particular lift form. ESP (Electrical Submersible Pumping) is the most essential and often considered artificial lift around the globe for producing liquid quantities above 500 bbls/days from deep and shallow reservoirs. When properly selected and operated, it can deliver significant hydrocarbon volumes that can improve the initial rate of returns (IROR) of challenging to produce assets. That is why it also commands the most significant capital expenditure allocations in global artificial lift markets on an annualized basis. On the other hand, poor selection and management can lead to suboptimal production rates with poor operational efficiencies and higher failures leading to deferred production with higher CAPEX/OPEX. It is vital to understand the interdependency between reservoir, wellbore, and surface installations with ESP equipment.

Special well conditions like high viscosity fluids, free gas production, and abrasive materials require special equipment, completely covered during the course. A brief discussion on ESP applications in unconventional wells is included. The course covers the application of Variable Speed Drives and their advantages in producing oil wells. The course covers the main components, application envelope, relative strengths, and weaknesses of ESP in its different forms. While providing intermediate-level instructions, the training arms attendees with sufficient detail to participate in the informed decision-making process. A special feature of this course is a discussion of the digital oilfield and a brief review of machine learning applications in the operations of ESPs.



Learning Outcomes

- Understand the basic fundamental theories and procedures related to ESP operations.
- Provide a thorough introduction to the theory and application of ESP, and demonstrate the advantages and limitations of ESP systems.
- Become acquainted with ESP system evaluation, design, installation, and operation concepts.
- Easily recognize the different components of the ESP system and their basic structural and operational features.
- Understand how special well conditions (high fluid viscosity, free gas production, abrasives in well fluids, unconventional developments) can be handled by properly designed ESP systems.
- Have a working knowledge of the types, the application, and the advantages of Variable Speed Drives.
- Be able to design an ESP installation and select the optimum components of the ESP system.
- Be able to use NODAL Analysis program packages to describe the operation of ESP installations.
- Have a basic understanding of the ESP system's power efficiency and system losses.
- Be able to conduct basic troubleshooting of ESP installations.
- Understand how digital oilfield tools help address ESP challenges.
- Learn recent advances in real-time approaches to production monitoring and lift management.

Who Should Attend

- Production, reservoir, completion, drilling and facilities engineers, analysts, and operators
- Anyone interested in learning about implications of ESP systems for their fields and reservoirs.

Prerequisites

- Understanding of petroleum production concepts.

Course Content

- Pre-test
- Introduction
 - Artificial Lift: When / Why / What of Lift Mechanisms; Types
 - How ESP is the same as and different from other lift forms; relative market position
 - Well Life Cycles and hydraulic lift applicability vis-a-vis other lift methods
- Introduction to ESP Operations
 - ESP Basics
 - Advantages, Limitations and Operating Principle
 - System Components: Downhole and Surface
- Well Inflow Performance
 - The Productivity Index Concept
 - Inflow Performance Relationships (Class Problem)
- Hydraulic Fundamentals
 - Tubing Flow Calculations (Class Problem)
 - Operational Basics of Centrifugal Pumps (Class Problem)
- Electrical Fundamentals
 - Alternating Current



- Transformers
- Induction Motors
- Electric Cables
- Application of NODAL Analysis
 - Basic Principles
 - Systems/NODAL Analysis
 - Reservoir Performance
 - Vertical Lift Performance
 - Total Dynamic Head (TDH)
- ESP Components and Their Operational Features
 - The ESP Pump
 - Performance Curves and their Use
 - Pump Types
 - The ESP Motor
 - Performance Curves, Startup Conditions
 - Motor Temperature Calculations
 - Protectors (Seal Sections)
 - Functions, Types, and Main Parts
 - The ESP Cable: Materials, Constructions and Features
 - Other Surface and Downhole Components
- ESP Installation Design
 - Design and Optimization
 - Pump Curve
 - Affinity Laws
 - Equipment Selection and Sizing
 - VSD Application Concepts
- Use of ESP Equipment in Special Conditions
 - Pumping Viscous Fluids (Class Problem)
 - Producing Wells with High GLRs
 - Free Gas Volume Calculations (Class Problem)
 - Pump Performance Degradation
 - Utilization of Natural Gas Separation
 - Rotary Gas Separators
 - Gas Handling
 - Use of Motor Shrouds
 - High Well Temperature
 - ESP Systems for Abrasive Service
 - ESP Challenges in Unconventional Wells
 - Lessons from Unconventional Fields
- Variable Speed Applications
 - Variable Speed Drives



- Constructional Details
 - Available VSD Types
- Operational Characteristics
- Variable Frequency Generators
- Interaction of VSD/VFG and ESP Units (Class Problem)
- Benefits of using VSD/VFG Units
- ESP Operations
 - Role of Real-Time Measurements and SCADA Applications
 - Challenging Applications and Mitigation Approaches
 - Importance of ESP Reliability and DIFA (Dismantle Inspection Failure Analysis)
 - ESP Lift Lifecycle
- Advances in ESP and Emerging Applications
 - Permanent Magnet Motors
 - Wireline and Coiled Tubing Deployed Systems
 - High-Temperature and High-Viscosity Applications
 - Ultra-High-Speed Applications
- Digital Oil Field in ESP
- ML/AI ESP Application Review
- Post-test

Format and Duration

- In-person (ESP using NODAL Analysis variant): 5 days.
- Virtual (Advanced Artificial Lifting with ESP variant): taught using MS Teams (arranged by the instructor) over 4 sessions, each of 6 hours, over four consecutive days. Alternatively, it could be taught over 6 sessions of 4 hours or 8 sessions of 3 hours each.
- Course level: Intermediate to Advanced.
- Software: PROSPER software package is used to demonstrate the effective use of NODAL analysis.
- Option: Client's real-time system-based workflows and examples can be incorporated in the class discussions. Requires two days of consulting and access to the client system at least 4 weeks before the class.

Customize This Course

Every course in this catalogue is a starting point. Content, depth and length are adjusted to your assets, your audience and your schedule.

- Depth and length: shorter or longer, from a focused one-day session to a multi-day program, pitched at the skill level of your team.
- Focus: emphasize the lift methods, well types and topics that matter for your assets, for example gas-lift only, ESP only, or unconventional wells.
- Your data and software: optionally work with your own field data and the software available in your company. This needs advance preparation with the instructor and access to your data and software before the class.



- Delivery: in person at your site or a venue of your choice, or virtual, in full days or half-day sessions.



Optimization of ESP & Gas-Lift

5 Days or
40 Hours

Competence level:
Intermediate to
Advanced



In-Person or
Virtual Course

Course Description

Artificial lift systems are an important part of production operations for the entire lifecycle of an asset. Most oil and gas wells require artificial lift for most of their productive life. Practical understanding of artificial lift concepts is a must in order to profitably exploit the existing assets to the fullest extent. We will not only discuss the underlying concepts in a global sense but also focus on your company's needs. Using commercial software available in your company, we will solve ESP and gas-lift exercises with your field data. We will briefly cover emerging digital oil field paradigms and the application of data analytics to artificial lift in production engineer's language.

- This five-day workshop offers a comprehensive treatment of artificial lift techniques for production optimization.
- The workshop emphasis is on ESP and Gas-Lift systems with hands-on examples developed from the operator's field data.
- The course introduces participants to important concepts of each form of artificial lift system from downhole to the surface, including real-time optimization infrastructure.
- Using software available with the operator, it shows how ESP and Gas-lift systems are designed and analysed.
- It covers challenges facing lift applications and addresses how digital oilfield tools help address these challenges.
- Recent advances in real-time approaches to ESP and Gas-lift management are also discussed using field case studies.
- PROSPER software package is used to demonstrate the effective use of NODAL analysis.

Learning Outcomes

- Develop understanding of the fundamentals of production by introducing fluid flow, flow correlations, PVT/Black Oil, and discussing the inflow performance relationship (IPR), vertical lift performance (VLP), nodal analysis, and pressure gradient curves.
- Introduce applications of major forms of artificial lift like gas-lift (GL), reciprocating rod lift (RRL), electrical submersible pumping (ESP), progressing cavity pumping (PCP), hydraulic jet and piston pump (HJP), plunger and capillary injection. Detailed coverage for GL and ESP.
- Provide knowledge to the participants about the entire lift system, from downhole to the surface, and relevant components for GL, RRL, ESP, PCP, HJP, and Plunger.
- Discuss challenges facing lift applications.
- Explore the importance of downhole monitoring and surface measurements.
- Learn how digital oil field concepts are applicable and what the data analytics challenges are.



Who Should Attend

- Production, reservoir, completion, drilling and facilities engineers interested in learning about selection, design, analysis and optimum operation of artificial lift and related production systems will benefit from this course.

Prerequisites

- Understanding of petroleum production concepts. Attendees should have a petroleum engineering background or at least two years of working experience in the industry.

Course Content

- Module 1: Production Fundamentals
 - What is Systems or Nodal Analysis?
 - Multiphase Flow
 - PVT Properties
 - Well Performance: Inflow Performance, Outflow Performance
 - Artificial Lift Systems: What, Why, How? Main Types and Classification
- Module 2: Continuous Gas-Lift
 - What is gas lift and why is it used?
 - Applications, benefits and limitations
 - Gas-Lift Valves and Mandrels
 - Force Balance and Design Process
 - Design Example
 - Optimization and Operations
- Module 3: Electrical Submersible Pumping System
 - What is ESP and why is it used?
 - Applications, benefits and limitations
 - ESP Surface and Downhole components
 - Automation
 - Well Performance Curve and Design Considerations
- Module 4: Other Lift Forms: Rod Lift, Hydraulic Lift, PCP, Plunger Lift, Capillary Injection
 - Brief discussion on what each form is and why it is used
 - Applications, benefits and limitations for each of these lift methods
 - Compare and contrast these lift methods to ESP and Gas-Lift
- Module 5: Artificial Lift Selection and Some Operational Aspects
 - Life cycle of Artificial Lift
 - Lift Changeovers
- Module 6: Digital Oil Field for Production Optimization
 - What is production Optimization and Digital Oil Field (DOF)?
 - DOF components for ESP and Gas-Lift systems
 - Wellsite and Desktop Approach
 - Full Field Optimization
- Module 7: Real-Time Downhole and Surface Measurements and Role of Data Analytics



- Available Technologies
- Downhole P/T Measurements Components
- Surface Flow Measurement Components
- Role of software in visualization, analysis and surveillance
- Data Cleanliness
- Brief discussion on use cases for data analytics
- Data Analytics techniques being researched/applied
- Module 8: Hands-on Workshop with industry software available with client
 - Gas-Lift Examples from client's fields
 - ESP Examples from client's fields

Format and Duration

- Format: workshop.
- Duration: five days.
- Level: Intermediate to Advanced.
- Hands-on exercises use commercial software available in the client's company with the client's field data (Module 8).
- PROSPER software package is used to demonstrate the effective use of NODAL analysis.

Customize This Course

Every course in this catalogue is a starting point. Content, depth and length are adjusted to your assets, your audience and your schedule.

- Depth and length: shorter or longer, from a focused one-day session to a multi-day program, pitched at the skill level of your team.
- Focus: emphasize the lift methods, well types and topics that matter for your assets, for example gas-lift only, ESP only, or unconventional wells.
- Your data and software: optionally work with your own field data and the software available in your company. This needs advance preparation with the instructor and access to your data and software before the class.
- Delivery: in person at your site or a venue of your choice, or virtual, in full days or half-day sessions.



Optimization of ESP & Sucker Rod Pumping

5 Days or
40 Hours

Competence level:
Intermediate to
Advanced



In-Person or
Virtual Course

Course Description

Artificial lift systems are an important part of production operations for the entire lifecycle of an asset. Most oil and gas wells require artificial lift for most of their productive life. Practical understanding of artificial lift concepts is a must in order to profitably exploit the existing assets to the fullest extent. We will not only discuss the underlying concepts in a global sense but also focus on your company's needs. Using commercial software available in your company, we will solve ESP and rod lift exercises with your field data. We will briefly cover emerging digital oil field paradigms and the application of data analytics to artificial lift in production engineer's language.

- This five-day workshop offers a comprehensive treatment of artificial lift techniques for production optimization.
- The workshop emphasis is on ESP and Gas-Lift systems with hands-on examples developed from the operator's field data.
- The course introduces participants to important concepts of each form of artificial lift system from downhole to the surface, including real-time optimization infrastructure.
- Using software available with the operator, it shows how ESP and rod lift systems are designed and analysed.
- It covers challenges facing lift applications and addresses how digital oilfield tools help address these challenges.
- Recent advances in real-time approaches to ESP and rod lift management are also discussed using field case studies.
- PROSPER and QROD software packages are used to demonstrate the effective use of design and analysis.

Learning Outcomes

- Develop understanding of the fundamentals of production by introducing fluid flow, flow correlations, PVT/Black Oil, and discussing the inflow performance relationship (IPR), vertical lift performance (VLP), nodal analysis, and pressure gradient curves.
- Introduce applications of major forms of artificial lift like reciprocating rod lift (RRL), electrical submersible pumping (ESP), gas-lift (GL), progressing cavity pumping (PCP), hydraulic jet and piston pump (HJP), plunger and capillary injection. Detailed coverage for GL and ESP.
- Provide knowledge to the participants about the entire lift system, from downhole to the surface, and relevant components for GL, RRL, ESP, PCP, HJP, and Plunger.
- Discuss challenges facing lift applications.
- Explore the importance of downhole monitoring and surface measurements.
- Learn how digital oil field concepts are applicable and what the data analytics challenges are.



Who Should Attend

- Production, reservoir, completion, drilling and facilities engineers interested in learning about selection, design, analysis and optimum operation of artificial lift and related production systems will benefit from this course.

Prerequisites

- Understanding of petroleum production concepts. Attendees should have a petroleum engineering background or at least two years of working experience in the industry.

Course Content

- Module 1: Production Fundamentals
 - What is Systems or Nodal Analysis?
 - Multiphase Flow
 - PVT Properties
 - Well Performance: Inflow Performance, Outflow Performance
 - Artificial Lift Systems: What, Why, How? Main Types and Classification
- Module 2: Reciprocating Rod Lift
 - What is rod lift and why is it used?
 - Applications, benefits and limitations
 - Downhole Equipment: Pumps
 - Sucker Rods
 - Surface Rod Pumping Units
 - Dynamometer Cards
 - Automation
 - Design Example
- Module 3: Electrical Submersible Pumping System
 - What is ESP and why is it used?
 - Applications, benefits and limitations
 - ESP Surface and Downhole components
 - Automation
 - Well Performance Curve and Design Considerations
- Module 4: Other Lift Forms: Gas Lift, Hydraulic Lift, PCP, Plunger Lift, Capillary Injection
 - Brief discussion on what each form is and why it is used
 - Applications, benefits and limitations for each of these lift methods
 - Compare and contrast these lift methods to ESP and Gas-Lift
- Module 5: Artificial Lift Selection and Some Operational Aspects
 - Life cycle of Artificial Lift
 - Lift Changeovers
- Module 6: Digital Oil Field for Production Optimization
 - What is production Optimization and Digital Oil Field (DOF)?
 - DOF components for ESP and Gas-Lift systems
 - Wellsite and Desktop Approach



- Full Field Optimization
- Module 7: Real-Time Downhole and Surface Measurements and Role of Data Analytics
 - Available Technologies
 - Downhole P/T Measurements Components
 - Surface Flow Measurement Components
 - Role of software in visualization, analysis and surveillance
 - Data Cleanliness
 - Brief discussion on use cases for data analytics
 - Data Analytics techniques being researched/applied
- Module 8: Hands-on Workshop with industry software available with client
 - Gas-Lift Examples from client's fields
 - ESP Examples from client's fields

Format and Duration

- Format: workshop.
- Duration: five days.
- Level: Intermediate to Advanced.
- Timings: registration begins at 08:30. Course sessions start promptly at 09:00 and end at 17:00. There are two short breaks for refreshments, and lunch is from 12:30 to 13:30.
- Hands-on exercises use commercial software available in the client's company with the client's field data (Module 8).
- PROSPER and QROD software packages are used to demonstrate the effective use of design and analysis.

Customize This Course

Every course in this catalogue is a starting point. Content, depth and length are adjusted to your assets, your audience and your schedule.

- Depth and length: shorter or longer, from a focused one-day session to a multi-day program, pitched at the skill level of your team.
- Focus: emphasize the lift methods, well types and topics that matter for your assets, for example gas-lift only, ESP only, or unconventional wells.
- Your data and software: optionally work with your own field data and the software available in your company. This needs advance preparation with the instructor and access to your data and software before the class.
- Delivery: in person at your site or a venue of your choice, or virtual, in full days or half-day sessions.



Gas Well Deliquification and Production Optimization

2 Days or
16 Hours

Competence level:
Intermediate



In-Person or
Virtual Course

Course Description

Ever-increasing demands related to cost savings and efficiency improvement require that existing as well as planned gas production assets are fully and optimally utilized. Most gas wells produce liquid in the form of water or condensate. If this liquid is not removed from the wellbore in a timely manner, gas production suffers dramatically and eventually ceases altogether. In the case of coal-bed methane (CBM) wells, removal of water releases adsorbed methane from the coal seam. Thus, liquid loading impacts the productivity of most gas assets.

Deliquification, an effective way of removing liquid from the wellbore, requires deployment of artificial lift and production optimization techniques for most of a gas well's productive life. Careful selection, design and operation of the artificial lift system is extremely important for profitability. Efficient and cost-effective production workflows involve field management using digital oilfield concepts. Understanding these production concepts is a must to profitably exploit existing assets fully.

The objective of the course is to:

- Provide an awareness of the fundamentals of production from gas wells by introducing fluid flow, flow correlations, PVT/Black Oil, and discussing the inflow performance relationship (IPR), vertical lift performance (VLP), nodal analysis, and pressure gradient curves.
- Introduce liquid loading in gas wells and the need for deliquification.
- Introduce artificial lift for gas wells, with plunger lift and capillary injection systems covered in detail.
- Introduce other means for deliquification such as surface compression, velocity strings and dead strings.
- Provide knowledge about the lift system, from downhole to the surface, and relevant components for plunger lift and capillary injection.
- Discuss challenges facing lift applications.
- Explore the importance of downhole monitoring and surface measurements.

The course is also offered in a gas-lift focused virtual variant, Gas-Lift & Deliquification Applications. Gas-lift is one of the predominant forms of artificial lift used for lifting liquids from conventional, unconventional, onshore and offshore assets. Proper application of gas-lift to loaded-up gas wells can be one of the most effective ways to improve the profitability of a gas well portfolio. Gas-lift and its various forms (intermittent lift, gas-assisted plunger lift) allow life-of-well lift possibilities when selected and applied properly. This variant gives trainees a thorough understanding of gas-lift technology and related application concepts.

Most oil and gas wells require artificial lift at some point, and for most of the life cycle, to achieve production objectives. There are at least eight forms of artificial lift technologies available in the market. Each lift system's applicability often overlaps with other lift systems, and it is important to understand the positioning and strength of a particular lift form. Unlike mechanical methods of



lifting, gas-lift performance relies heavily on understanding the interdependence between reservoir, wellbore and surface installations. The gas-lift variant focuses on gas-lift applications and related system analysis (often called NODAL analysis) concepts. While providing instruction at an intermediate level, the training arms attendees with sufficient detail to participate in the informed decision-making process. Its main objectives are to:

- Provide a thorough introduction to the theory of gas lift.
- Demonstrate the advantages and limitations of gas-lift systems.
- Acquaint the student with system evaluation, design, installation and operation concepts.

It covers the main components, application envelope, and relative strengths and weaknesses of gas-lift and its different forms, such as intermittent lift and gas-assisted plunger lift for producing oil wells, and deliquification of gas wells. A unique feature is a discussion on digital oilfield and machine learning as applicable to gas-lift optimization. PROSPER or SNAP software is used to demonstrate the effective use of NODAL analysis.

Learning Outcomes

- A thorough treatment of the liquid loading and deliquification problem, including artificial lift techniques for production optimization of gas and CBM wells.
- The basics of the main deliquification options, from completion changes and surface compression to capillary injection and plunger lift.
- Challenges facing lift applications.

Who Should Attend

- Production engineers and field operators
- Reservoir engineers
- Completion engineers
- Drilling and facilities engineers working in integrated project teams
- Anyone interested in learning about selection, design, analysis and optimum operation of artificial lift and related production systems
- Project and asset managers interested in expanding their understanding of the effects of deliquification and the impact of artificial lift on the performance of their assets
- Gas-lift variant: production, reservoir, completion, drilling and facilities engineers, and anyone interested in the implications of gas-lift systems for their fields and reservoirs

Prerequisites

- Gas-lift & deliquification variant: understanding of petroleum production concepts.

Course Content

Two-day format (Gas Well Deliquification and Production Optimization)

- Day 1: Introduction to Systems Analysis & Gas Well Loading Problem
 - Pre-test
 - Multiphase flow
 - PVT properties
 - Inflow / Outflow Performance and sensitivity analysis
 - Gas well loading and deliquification problem
 - Completion selection for deliquification



- Dead string
 - Velocity string
- Surface compression and multiphase pumping
- Day 2: Introduction to Artificial Lift, Capillary Systems, Plunger Lift
 - Artificial Lift Systems: Basics, Why/What/How
 - Capillary Injection Systems
 - Applications, pluses/minuses
 - Chemical delivery
 - Selection considerations
 - Special applications in shale, long perforations
 - Plunger Lift
 - Applications, pluses/minuses
 - Bottom hole and surface setup: plungers, BHA, lubricator
 - Selection and special applications
 - Surveillance

Virtual format (Gas-Lift & Deliquification Applications)

- Modules 1 & 2
 - Introduction
 - Artificial Lift: When / Why / What of lift mechanisms; types
 - How gas-lift is the same as and different from other lift forms; relative market position
 - Well Performance: review of fundamentals
 - Systems/NODAL analysis
 - Reservoir performance: Productivity Index and Inflow Performance Relationship (IPR)
 - PVT analysis
 - Multiphase flow
 - Flow correlations and mechanistic models; flow regimes/maps
 - Pressure gradient curves
 - VLP: Vertical Lift Performance
 - Gas-Lift
 - Types; application; advantages, limitations
 - Equipment: downhole and surface
 - Gas-lift production rate and well evaluation basics: operating point analysis
- Modules 3 & 4
 - Gas-Lift Valve Mechanics
 - Valve classifications: IPO, PPO, Pilot, Dummy
 - Continuous flow unloading sequence
 - Importance of true valve performance
 - Gas-Lift Installation Design
 - Overview of IPO design methodology; valve spacing and valve sizing
 - Design and optimization
- Modules 5 & 6



- Gas Well Deliquification Options
 - Plunger lift
 - Gas-lift well life cycles
 - Gas-assisted plunger lift (GAPL)
 - Plunger-assisted gas lift (PAGL)
 - Intermittent gas-lift basics and overview of design
- Modules 7 & 8
 - Injection infrastructure: compression and sizing
 - Well unloading procedure and guidelines
 - Gas-lift troubleshooting and diagnostics
 - Digital oilfield and ML introductions as applicable to gas-lift

Format and Duration

- Gas Well Deliquification and Production Optimization: 2 days or 16 hours, in person or virtual, Intermediate level.
- Optionally a workshop component can be incorporated that uses client-supplied software and well data to solve field problems. This requires three days of consulting work prior to the training.
- Gas-Lift & Deliquification Applications: virtual course, 3 days or 24 hours, Intermediate to Advanced level. Conducted over 8 sessions of three hours each across two consecutive weeks at a mutually convenient time. It could also be taught over six sessions of four hours each over two consecutive weeks.
- Software: PROSPER or SNAP is used in the gas-lift variant to demonstrate NODAL analysis. For the general course, appropriate software tools are optionally used to show how lift components are designed and analyzed.

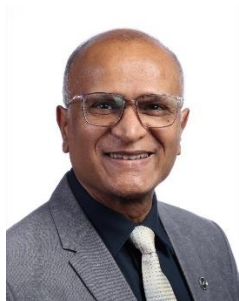
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Instructor Profile



Dr. Rajan Chokshi has 42 years of experience in artificial lift, real-time production optimization, software development, and management. He is currently engaged in projects related to artificial lift optimization, multi-phase flow calculations, failure prediction, virtual flow meter development, emission reduction, and competency management. He has worked for national oil companies, major corporations, independent companies, service providers, and technology firms.

He has co-authored over fifteen papers for the Society of Petroleum Engineers (SPE), holds three patents, and has conducted many webinars and training courses for SPE. He is an SPE Artificial Lift Legend (2026) and a two-time SPE Distinguished Lecturer.

In addition to conducting professional workshops globally, he has taught at Texas Tech University, Missouri S&T, the University of Southern California, and the University of Houston. He generously dedicates his time to reviewing technical papers, serving on SPE technical committees, and serving as Executive Board Member and Board Secretary of the Artificial Lift Research and Development Council (ALRDC).

Dr. Chokshi holds a Bachelor's and Master's in chemical engineering from the Gujarat University and IIT-Kanpur, India, and a Ph.D. in Petroleum Engineering from the University of Tulsa, USA.

Worldwide Experience in Training / Seminar / Workshop Deliveries:

- Several SPE webinars, ALRDC, MEALF, and SPE trainings globally on artificial lift and production optimization themes.
- Graduate courses at Texas Tech, Missouri S&T, Louisiana State, PDP, U of Southern California, and U of Houston.

Bespoke trainings / workshops and seminars globally for practicing professionals.

- Companies: Apache, Basra Oil Company, CCED, Chevron, Cimarex, ConocoPhillips, EcoPetrol, Equinor, Kuwait Oil Company, ONGC, Linn Energy, LukOil, Mari Petroleum, Mellita, Newfield Exploration, Noble Energy, Oasis Petroleum, Occidental Petroleum, PanAmerican Energy, PDO, PDVSA, PEMEX, PetroCanada, Petronas, Qatar Petroleum, Repsol, Santos, Saudi Aramco, Shell, Sonatreh, StatOil, Tatneft, United Energy Pakistan, Vaalco Energy, Vista Energy, YPF, and others.
- Countries: USA, Algeria, Argentina, Australia, Bahrain, Brazil, Canada, China, Colombia, Congo, Croatia, Ecuador, Ghana, India, Indonesia, Iraq, Kazakhstan, Kenya, Kuwait, Libya, Malaysia, Mexico, Norway, Oman, Pakistan, Qatar, Romania, Russia, Saudi Arabia, Serbia, South Korea, Tanzania, Thailand, Trinidad & Tobago, Tunisia, Turkmenistan, UAE, Ukraine, Uzbekistan, Venezuela.
- Multiple virtual trainings have been provided to global audiences since 2020.