Artificial Lift Methods

Course Duration	:	5 days
Date	:	13-Jan-2025 to 17-Jan-2025
Location	:	London, UK
Type of Participant	:	This training course is designed for and will greatly benefit Production engineers, supervisors, petroleum engineers who are new to the profession, field operators, and technicians. Company staff involved in critical lift and subsurface production operations. Completion, reservoir and drilling engineers concerned with well performance & production enhancement facilities. Managers and government officials and others involved with the production systems. Technical and operations staff from other disciplines, who require cross-training or a basic understanding of the subsurface production operations and participants should be familiar with basic Production Engineering, have some field experience in Production and basic knowledge of artificial lift systems.

Summary:

This course presents a complete overview of the most widely used artificial lift systems in the oil and gas industry.

This course provides basic knowledge of Artificial Lift, review of fluid properties, multiphase flow regimes, and all lifting methods: rod pumps, progressive cavity pumps (PCP), gas lifts, and electrical submersible pumps (ESP).

Discussion of alternate deployments and multi-sensor applications for surveillance and optimization. Strategies and best practices for field production optimization are discussed. The effectiveness of **NODAL systems analysis** for lifting performance optimization is demonstrated.

This interactive course-type presentation blends lectures with some hands-on

problem-solving workshops with adequate Q&A sessions. Detailed design, troubleshooting, evaluation, economic analysis, and maintenance of the artificial lift systems will be covered.

Objective:

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

- Recognize the need for the artificial lift system
- How to select the best system for each condition
- Gain in-depth knowledge on artificial lift system completion, selection, and design
- Apply and gain in-depth knowledge of the subsurface production operations
- Explain reservoir performance such as inflow & outflow relationships
- Apply and gain proper techniques on artificial lift systems and optimization technology
- Discuss criteria for artificial lift system selection and artificial lift screening methods
- Apply basic design and analysis concepts and specify the main components needed for each artificial lift system (gas lift systems, ESP systems, sucker rod pumping, jet pumps, hydraulic pumps, and progressive cavity pumps)
- Understand the fundamentals & production performance of various artificial lift methodologies.
- Increase awareness and knowledge of artificial lift methodologies and factors affecting optimal designs and operations, including fluid properties and multiphase flow regimes.
- Overview of lift techniques, technologies, and equipment also covers alternate deployment scenarios and multisensory applications for surveillance and optimization.
- Possess the basic skills required to select and size artificial lift systems
- Select a suitable artificial lift system, plan its operation, monitor and analyze its performance.
- Learn strategies and best practices for field production optimization
- Apply techniques to maximize oil production economically with artificial lift

systems
- Make basic PVT properties and inflow performance calculations related to artificial lift
- Select the appropriate artificial lift system by examining the drawdown potential of each method, the initial and operating expense and the range of production and depth possible with each method as well as special problems such as sand/scale/deviation etc.
- Design and operate system features for each method under harsh conditions

Contents:

- Oil Field Production System
- Oil origin and Geology
- Well drilling and completion types
- Surface production facilities
- Reservoir recovery methods
- Reservoir life cycle and phase change concept
- Natural depletion (production) system
- Artificial lift production system
- Reservoir Performance IPR & OPR
- Wellbore and reservoir performance overview
- Pressure losses in the system
- Well productivity
- Concepts of productivity index
- IPR & OPR
- Nodal System Analysis
- Why & When Artificial Lift is Required?
- Well production problems
- Formation damage
- Formation damage causes and prevention techniques
- The change in the reservoir conditions and impact on well performance
- When the artificial lift is recommended? Why? Which system?
- Overview of artificial lift technology: GL, SRP, HPs, ESP, PCP, Plunger system & Capillary system.
- Application of artificial lift technology and limitations

- Artificial lift screening methods
- The basis for the selection of artificial lift systems
- Gas Lift (GL)
- Concept, types, limitations, and advantages
- Design, components, and operations
- Limitation and advantages
- Continuous and Intermittent Gas Lift
- Main equipment parts
- IPR and designing Gas Lift
- Optimization and allocation of Gas for Gas lift
- Production system operations by Gas Lift
- Lifting capability compared to other artificial lift methods
- Importance of correctly matching well productivity to system performance
- Use of data to diagnose well/equipment problems
- System Troubleshooting
- Understanding & improving gas lift compressor
- Gas lift optimization
- Gas lift well performance prediction
- Sucker Rod Pump (SRP)
- Concept, types, limitations and advantages
- Design, components and operations
- Limitation and advantages
- Main equipment parts
- Production system operations by SRP
- Lifting capability compared to other artificial lift methods
- Intake Pump Curve
- Production Optimization
- Design Sucker Rod Pump
- Factors affecting the movement of the rod
- Lifting capability compared to other artificial lift methods
- Importance of correctly matching well productivity to pump performance
- Use of data to diagnose well/equipment problems
- SRP Troubleshooting
- Pump stroke optimization

- Sucker rod failure analysis
- Progressive Cavity Pump (PCP)
- Concept, types, limitations and advantages
- Design, components and operations
- Limitation and advantages
- Main equipment parts
- Production system operations by PCP
- Lifting capability compared to other artificial lift methods
- Elastomer
- Design
- Lifting capability compared to other artificial lift methods
- Importance of correctly matching well productivity to pump performance
- Use of data to diagnose well/equipment problems
- PCP troubleshooting
- Rotor failure analysis
- Pump performance
- Electric Submersible Pump (ESP)
- Concept, types, limitations and advantages
- Design, components and operations
- Limitation and advantages
- Main equipment parts
- Production system operations by ESP
- Lifting capability compared to other artificial lift methods
- Basics of ESP calculations
- ESP Construction
- Pump Selection
- Applications in the Field
- Importance of correctly matching well productivity to pump performance
- Use of data to diagnose well/equipment problems
- ESP Troubleshooting
- Pump failure analysis
- Y-tool system & reservoir surveillance
- Power saving with permanent magnet motor
- Change in contract strategy save millions

- Hydraulic Pump (HP)
- Surface Equipment components and Operation concept
- Types of Pump Units
- Pump Sizing
- Pump selection
- Lifting capability compared to other artificial lift methods
- Importance of correctly matching well productivity to pump performance
- Use of data to diagnose well/equipment problems
- Pump Troubleshooting
- Module9: Jet Pump (JP)
- Components and Operation concept
- Gas issue
- Nozzle & Throat sizing
- Jet pump calculations
- Pump performance graph
- Lifting capability compared to other artificial lift methods
- Importance of correctly matching well productivity to pump performance
- Use of data to diagnose well/equipment problems
- Jet pump troubleshooting
- Flow analysis inside the jet pump
- Pump failure analysis
- Plunger System
- Components and Operation concept
- Conventional and Continuous Plunger Lift
- Lifting capability compared to other artificial lift methods
- Drawdown and IPRs for Plunger Lift
- Importance of correctly matching well productivity to system performance
- Use of data to diagnose well/equipment problems
- Plunger Lift Troubleshooting
- Impact of the well deviation angle on system performance
- Capillary System
- Components and Operation concept
- Lifting capabilities and performance
- Applications in the field

- Importance of correctly matching well productivity to system performance
- Use of data to diagnose well/equipment problems
- Troubleshooting

Training Methodology:

This interactive training course includes the following training methodologies as a percentage of the total tuition hours:-

30% Lectures

20% Workshops & Work Presentations

20% Case Studies & Practical Exercises

30% Videos, Software & Simulators

Pre-Test and Post-Test

Group Work

Discussion

Presentation

In an unlikely event, the course instructor may modify the above training methodology before or during the course for technical reasons.

Daily Program:

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the course for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1

Welcome & Introduction

PRE-TEST

Oil Field Production System

Oil origin and Geology

Well drilling and completion types

Surface production facilities

Reservoir recovery methods

Reservoir life cycle and phase change concept

Natural depletion (production) system

Artificial lift production system

Reservoir Performance IPR & OPR

Wellbore and reservoir performance overview

Pressure losses in the system

Well productivity

Concepts of productivity index

IPR & OPR

Nodal System Analysis

Day 2

Quizzes & Recap

Why & When Artificial Lift is Required?

Well production problems

Formation damage

Formation damage causes and prevention techniques

The change in the reservoir conditions and impact on well performance

When the artificial lift is recommended? Why? Which system?

Overview of artificial lift technology: GL, SRP, HPs, ESP, PCP, Plunger system & Capillary system.

Application of artificial lift technology and limitations

Artificial lift screening methods

The basis for the selection of artificial lift systems

Gas Lift (GL)

Concept, types, limitations, and advantages

Design, components, and operations

Limitation and advantages

Continuous and Intermittent Gas Lift

Main equipment parts

IPR and designing Gas Lift

Optimization and allocation of Gas for Gas lift

Production system operations by Gas Lift

Lifting capability compared to other artificial lift methods

Importance of correctly matching well productivity to system performance

Use of data to diagnose well/equipment problems

System Troubleshooting

Case Study

Understanding & improving gas lift compressor

Gas lift optimization

Gas lift well performance prediction

Day 3

Quizzes & Recap

Sucker Rod Pump (SRP)

Concept, types, limitations and advantages

Design, components and operations

Limitation and advantages

Main equipment parts

Production system operations by SRP

Lifting capability compared to other artificial lift methods

Intake Pump Curve

Production Optimization

Design Sucker Rod Pump

Factors affecting the movement of the rod

Lifting capability compared to other artificial lift methods

Importance of correctly matching well productivity to pump performance

Use of data to diagnose well/equipment problems

SRP Troubleshooting

Case Study

Pump stroke optimization

Sucker rod failure analysis

Progressive Cavity Pump (PCP)

Concept, types, limitations and advantages

Design, components and operations

Limitation and advantages

Main equipment parts

Production system operations by PCP

Lifting capability compared to other artificial lift methods

Elastomer

Design

Lifting capability compared to other artificial lift methods

Importance of correctly matching well productivity to pump performance

Use of data to diagnose well/equipment problems

PCP troubleshooting

Case Study

Rotor failure analysis

Pump performance

Day 4

Quizzes & Recap

Electric Submersible Pump (ESP)

Concept, types, limitations and advantages

Design, components and operations

Limitation and advantages

Main equipment parts

Production system operations by ESP

Lifting capability compared to other artificial lift methods

Basics of ESP calculations

ESP Construction

Pump Selection

Applications in the Field

Importance of correctly matching well productivity to pump performance

Use of data to diagnose well/equipment problems

ESP Troubleshooting

Case Study

Pump failure analysis

Y-tool system & reservoir surveillance

Power saving with permanent magnet motor

Change in contract strategy save millions

Hydraulic Pump (HP)

Surface Equipment components and Operation concept

Types of Pump Units

Pump Sizing

Pump selection

Lifting capability compared to other artificial lift methods

Importance of correctly matching well productivity to pump performance

Use of data to diagnose well/equipment problems

Pump Troubleshooting

Case Study

Q&A and exercises

Module9: Jet Pump (JP)

Introduction

Components and Operation concept

Gas issue

Nozzle & Throat sizing

Jet pump calculations

Pump performance graph

Lifting capability compared to other artificial lift methods

Importance of correctly matching well productivity to pump performance

Use of data to diagnose well/equipment problems

Jet pump troubleshooting

Case Study

Flow analysis inside the jet pump

Pump failure analysis

Day 5

Quizzes & Recap

Plunger System

 Introduction

Components and Operation concept

Conventional and Continuous Plunger Lift

 Lifting capability compared to other artificial lift methods

Drawdown and IPRs for Plunger Lift

 Importance of correctly matching well productivity to system performance

Use of data to diagnose well/equipment problems

 Plunger Lift Troubleshooting

 Case Study

Impact of the well deviation angle on system performance

Capillary System

Introduction

Components and Operation concept

Lifting capabilities and performance

Applications in the field

Importance of correctly matching well productivity to system performance

Use of data to diagnose well/equipment problems

Troubleshooting

Q & A and recap

Course Conclusion

POST-TEST

Presentation of Course Certificates

Lunch & End of Course