



Artificial Lift Systems Course: ESP, Rod Pump, PCP and Gas Lift Design



Artificial Lift Systems Course: ESP, Rod Pump, PCP and Gas Lift Design

Introduction:

Artificial lift systems design for ESP, rod pump, PCP and gas lift wells is the subject of this 10-day course for production, petroleum and well-site engineers and production technologists, who build an Artificial Lift Selection and Design Package for a case field. Many lifted wells underperform or fail early because the lift method was chosen by habit, pumps were sized on stale inflow data and card, amperage and gauge signals go unread. Nominees already operate or design lifted wells, and teaching is by modelling build on real well data. CoreConcept Training Center delivers this artificial lift course.

Course Objectives:

- Screen candidate wells against rate, depth, deviation, gas, sand and viscosity limits and justify the lift method chosen for each well group
- Size sucker rod pumping units, downhole pumps and tapered rod strings and diagnose rod-pumped wells from dynamometer cards and fluid level shots
- Select progressing cavity pump geometry, elastomer and drive head for viscous, sandy or aromatic fluids and set safe torque and speed limits
- Design ESP stages, motor, seal chamber, cable and variable speed drive for a target rate and specify gas handling for high free gas wells
- Space gas lift unloading valves, troubleshoot multipointing and unstable wells and judge when jet pumps or plunger lift suit a well better
- Track run-life KPIs, failure causes and lifting cost per barrel from gauge and SCADA data and rank wells for lift optimisation

Target Audience:

- Production engineers responsible for lifted well rates, pump sizing and workover proposals
 - Petroleum engineers who choose the lift method for new wells and field development phases
 - Well-site engineers who supervise pump installation, start-up and pulling jobs
 - Production technologists who monitor dynamometer, amperage and downhole gauge data and flag failing wells
 - Artificial lift and reliability specialists responsible for run-life, failure analysis and lift budgets
-

Course Outline:

Day 1: Inflow Performance Refresher and Artificial Lift Selection Screening

- Vogel and Productivity Index Curves for Lifted Well Targets
- Nodal Outflow Curves with Pump Intake Pressure as Node
- Lift Screening Matrix by Rate, Depth, Deviation and Gas-Liquid Ratio
- Sand, Viscosity, Temperature and Scale Constraints on Lift Choice
- Power Supply, Footprint and Workover Access Limits for Candidate Methods

Day 2: Sucker Rod Pumping Units, Downhole Pumps and Rod String Design

- Conventional, Air-Balanced and Long-Stroke Pumping Unit Geometry Compared
- Insert and Tubing Pump Selection with Plunger Fit
- API TR 11L Tapered Rod String Load Calculations
- Gearbox Torque, Counterbalance Effect and Prime Mover Sizing
- Rod Guide Placement and Tubing Anchor Design for Deviated Wells

Day 3: Dynamometer Card Diagnosis and Pump-Off Control

- Surface and Downhole Dynamometer Card Interpretation by Shape
- Fluid Pound, Gas Lock and Worn Valve Card Signatures
- Acoustic Fluid Level Shots for Pump Submergence Checks
- Pump-Off Controller Setpoints and Variable Speed Rod Lift Strategy
- Rod and Tubing Wear, Corrosion Fatigue and Failure Frequency Tracking

Day 4: Progressing Cavity Pump Sizing, Elastomers and Surface Drives

- Rotor-Stator Geometry, Displacement and Pressure Rating per Stage
- Nitrile and Hydrogenated Nitrile Elastomer Swell Compatibility Testing
- PCP Interference Fit Selection for Temperature and Aromatic Content
- Direct and Belt Drive Heads with Backspin Brake Control
- PCP Torque, Rod Stress and Sand Production Operating Limits

Day 5: Guided Case Study on Rod Pump and PCP Well Redesign

- Case Well Data Pack with Cards and Fluid Levels
 - Rod Pump Redesign for Higher Rate at Lower Rod Loading
 - PCP Versus Rod Pump Choice for a Viscous Sandy Producer
 - Run-Life History Review and Pump Failure Root Cause Ranking
 - Week-One Design Sheet Peer Review and Revision
-

Day 6: ESP Pump, Motor, Seal Chamber and Cable Design

- ESP Stage Performance Curves and Total Dynamic Head Calculation
- Pump Stage Count and Recommended Operating Range Selection
- Induction Motor Loading, Voltage Drop and Power Cable Sizing
- Seal Chamber Protector Types and Thrust Bearing Capacity Checks
- Variable Speed Drive Frequency Range and Harmonic Filter Selection

Day 7: ESP Gas Handling, Run-Life Risk and Teardown Failure Analysis

- Free Gas at Intake and Rotary Gas Separator Selection
- Gas Handling Stages for High Gas Fraction Wells
- API RP 11S3 Installation and Handling Checks at Wellsite
- API RP 11S Troubleshooting from Amperage Charts and Trips
- API RP 11S1 Teardown Reporting and Dismantle Failure Classification

Day 8: Gas Lift Unloading Design, Jet Pumps and Plunger Lift

- Unloading Valve Spacing and Injection Pressure Drop Design
- Injection Pressure and Production Pressure Operated Valve Mechanics
- Gas Lift Troubleshooting with Flowing Gradient Surveys and Multipointing
- Jet Pump Nozzle and Throat Sizing for Power Fluid
- Plunger Lift Cycle Overview for Liquid Loaded Gas Wells

Day 9: Lift Surveillance, Run-Life KPIs and Lift Economics

- Downhole Gauge Intake Pressure and Motor Temperature Trending
- SCADA Alarm Limits and Exception Lists for Lifted Wells
- Mean Time Between Failures and Run-Life KPI Calculation
- Lifting Cost per Barrel and Lift Method Net Present Value
- Well Optimisation Priority List by Incremental Lifted Rate

Day 10: Capstone Modelling Build of an Artificial Lift Selection and Design Package

- Case Field Brief with Well, Fluid and Facility Data
 - Capstone Lift Screening and Method Choice per Well Group
 - Capstone Rod Pump, PCP or ESP Sizing Sheets
 - Capstone Gas Lift Allocation and Surveillance Plan
 - Artificial Lift Selection and Design Package Completion and Presentation
-

Skills You Will Gain:

- Lift Method Screening
- Rod String Design
- Dynamometer Card Interpretation
- PCP Elastomer Selection
- ESP Sizing and Gas Handling
- Gas Lift Valve Spacing
- Pump Teardown Failure Analysis
- Lifting Cost Evaluation

Why Attend This Course:

- Deliver an Artificial Lift Selection and Design Package to the production engineering lead and asset manager for a case field
- Decide whether a well should stay on its current lift, be resized or be converted to another method
- Avoid premature pump pulls, burnt motors and lost rate caused by mis-sized equipment and unread surveillance signals
- Share card diagnosis guides, sizing sheets and teardown checklists with operators and well-site crews

Conclusion:

Back at work, the participant hands the Artificial Lift Selection and Design Package to the production engineering lead and asset manager, who use it to approve lift conversions, pump resizing and workover budgets. Well-site teams take the sizing sheets and installation checks into their next pulling jobs, and production technologists apply the alarm limits to daily surveillance. After the first lift change made with this method, the unit should compare actual intake pressure, rate and run-life against the design and update the screening matrix.

Frequently Asked Questions FAQ:

What should participants know before an artificial lift systems course on ESP, rod pump, PCP and gas lift design?

Participants should already work with producing wells, read well test and pressure data and understand basic inflow performance. Bringing anonymised data from one lifted well, such as cards, amperage charts or gauge trends, helps them apply the design exercises to a familiar case.

How does this artificial lift systems course differ from a general petroleum production engineering course?

This course spends all ten days on lift selection, sizing, diagnosis and run-life, while a general production engineering course gives lift one or two days beside inflow, completion and stimulation topics. Inflow and nodal analysis appear here only as a short refresher for pump design.

When is ESP preferred over rod pump, PCP or gas lift in artificial lift systems design?

ESP is usually preferred for high liquid rates and deeper or deviated wells with reliable power, while rod pumps suit lower rates in shallower wells, PCP suits viscous or sandy fluid at moderate depth and gas lift suits high gas-liquid ratio wells with injection gas available.

What does a participant take back to work from this artificial lift systems course?

Participants take back an Artificial Lift Selection and Design Package for a case field, with lift screening results, rod pump, PCP or ESP sizing sheets, a gas lift allocation, surveillance alarm limits and run-life KPIs that their production team can reuse.
