CONCEPT

Electric Submersible Pumps (ESP) Design and Operation Training Course



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Introduction:

Electric Submersible Pumps ESP Design and Operation Training Course is a one-week course for petroleum engineers sizing completions, production technologists optimising lift, and surveillance specialists tracking telemetry, culminating in an ESP Well Sizing and Operational Integrity Dossier. Suboptimal pump selection, downhole gas locking, and undetected electrical stresses cause premature pump failures and costly intervention cycles. Nominees already analyse wellhead pressures, basic inflow performance, and operating currents, progressing their capability through an applied modelling build. CoreConcept Training Center delivers this Electric Submersible Pumps ESP Design and Operation Training Course to ensure asset integrity and extend equipment run life.

Course Objectives:

- Determine total dynamic head, stage count, and motor power requirements using API RP 11S4 sizing methods.
- Select gas handling components and downhole separators to mitigate multiphase fluid locking in high gas-to-oil wells.
- Configure variable speed drive operating windows and pump performance curves using affinity laws to adapt to reservoir decline.
- Establish rig-site deployment and testing verification protocols following API RP 11S3 and ISO 15551:2023 standards.
- Diagnose downhole failure mechanisms using API RP 11S1 teardown procedures to eliminate root causes of premature system trips.
- Assemble the ESP Well Sizing and Operational Integrity Dossier to validate completion designs against reservoir operating limits.

Target Audience:

- Petroleum engineers responsible for calculating inflow performance relationships, selecting pump stages, and designing artificial lift completions.
- Production technologists responsible for monitoring well operating parameters, optimising electrical submersible pump performance, and mitigating multiphase gas interference.
- Artificial lift surveillance specialists responsible for tracking real-time downhole sensor telemetry, identifying electrical anomalies, and diagnosing pump operating deviations.
- Well intervention engineers responsible for overseeing rig-site pump deployments, conducting surface equipment checkouts, and verifying mechanical installation integrity.

Course Outline:

Day 1: ESP System Architecture and Inflow Performance Screening

- ISO 15551:2023 Standards Evaluating Downhole Centrifugal Lift Systems
- PROSPER Nodal Analysis Screening Well Inflow Performance Relationships
- API RP 11S4 Procedures Establishing Well Operating Flow Envelopes
- Reservoir Bubble Point Models Assessing Free Gas Volume Transitions
- Baseline Mechanical Surveys Reviewing Wellbore Deviation and Geometry Constraints

Day 2: Downhole Component Selection and Power Transmission Standards

- API RP 11S4 Formulas Calculating Total Dynamic Head Requirements
- ISO 15551:2023 Specifications Selecting Pump Stages and Thrust Bearings
- API RP 11S7 Procedures Sizing Seal Chamber Protector Sections
- API RP 11S5 Practices Specifying Downhole Cable and Armouring
- NACE MR0175 Metallurgy Requirements Selecting Sour Service Downhole Housings

Day 3: Surface Automation, Testing, and Rig-Site Installation

- API RP 11S2 Testing Protocols Verifying Pump Hydrodynamic Curves
- API RP 11S3 Procedures Conducting Rig Spooling and Clamping
- Variable Speed Drive Systems Applying Pump Affinity Speed Laws
- API RP 11S6 Standards Executing Surface and Downhole Electrical Checks
- Downhole Sensor Telemetry Calibrating Continuous Pressure and Temperature Signals

Day 4: Surveillance Diagnostics, Extreme Well Environments, and Failure Analysis

- API RP 11S1 Procedures Executing Teardown Root Cause Failure Analysis
- Rotary Gas Separator Workflows Mitigating Multiphase Fluid Slugging
- API RP 11S8 Guidelines Analysing Pump Radial and Axial Vibrations
- Severe Emulsion Models Correcting Viscous Fluid Head and Horsepower
- Real-Time Motor Amperage Charts Diagnosing Underload and Overload Conditions

Day 5: ESP Modelling Build and Operating Envelope Optimisation

- PROSPER Modelling Build Matching Reservoir Inflow and Multiphase Lift
- AutographPC Simulation Build Sizing Pump Stages and Motor Margins
- Variable Frequency Drive Modelling Build Establishing Safe Operating Windows
- API RP 11S1 Review Protocol Analysing Historical Asset Run-Life Trends
- ESP Well Sizing and Operational Integrity Dossier Finalising Documentation

Skills You Will Gain:

- Centrifugal Pump Stage Sizing
- Multiphase Gas Separation Sizing
- Electric Cable Thermal Rating
- Variable Speed Drive Optimisation
- Downhole Sensor Telemetry Diagnostics
- Root Cause Teardown Failure Analysis
- Well Nodal Inflow Integration

Why Attend This Course:

- Present the ESP Well Sizing and Operational Integrity Dossier to the petroleum engineering manager to validate downhole lift selections and operating specifications.
- Select appropriate pump stages, motor power ratings, and gas handling equipment based on dynamic inflow performance curves and gas-oil ratios.
- Prevent costly unplanned workover interventions and motor burnout caused by improper cooling, downhole vibration, or gas locking.
- Train operations colleagues in interpreting downhole sensor alarms, adjusting variable speed drive frequencies, and executing dismantle inspection reviews.

Conclusion:

Following this course, the organisation implements the ESP Well Sizing and Operational Integrity Dossier to align field development plans with robust artificial lift designs. The lead production engineer and asset operations superintendent utilise this deliverable to approve downhole equipment orders, verify variable speed drive control limits, and sanction well intervention schedules. Within ninety days of deployment, the production engineering team conducts an initial operational audit of operating electrical frequencies, intake pressures, and motor temperatures against design curves to confirm system stability, calibrate inflow assumptions, and safeguard asset run life.

Frequently Asked Questions FAQ:

Which roles should an organisation nominate for the Electric Submersible Pumps ESP Design and Operation Training Course?

Organisations should nominate petroleum engineers, production technologists, artificial lift surveillance specialists, and well intervention engineers. Nominees are operational practitioners who design downhole pump completions, supervise rig-site installations, track surface control parameters, and analyse operating telemetry to maintain well uptime and system run life across producing oilfields.

What should nominees already do at work before attending the Electric Submersible Pumps ESP Design and Operation Training Course?

Nominees should already evaluate well inflow performance data, interpret basic wellhead pressure charts, and monitor downhole pump operating currents. Experience in basic reservoir fluid properties and production operations ensures participants immediately engage with complex dynamic head calculations, multiphase handling selections, and variable speed drive optimisation models.

What does the organisation receive when the participant returns from the Electric Submersible Pumps ESP Design and Operation Training Course?

The organisation receives an ESP Well Sizing and Operational Integrity Dossier. This operational package provides verified nodal inflow matching models, pump stage selection sheets, variable frequency drive operating curves, and structured root-cause failure inspection templates designed to protect downhole equipment and extend mean time between failures.

Which standard or framework does the Electric Submersible Pumps ESP Design and Operation Training Course follow?

The course follows international standards including ISO 15551:2023 for electric submersible pump system design and testing, API RP 11S4 for sizing, API RP 11S3 for installation, and API RP 11S1:2022 for dismantle and teardown failure analysis, supplemented by NACE MR0175 material requirements for sour environments.