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Electrical Submersible Pumps (ESP): Design, Operations & Troubleshooting Training

12 – 16 July 2027
Barcelona

Electrical Submersible Pumps (ESP): Design, Operations & Troubleshooting Training

Ref: 715_26790 **Date:** 12 – 16 July 2027 **Location:** Barcelona **Fees:** 6200 GBP

Electrical Submersible Pumps ESP: Design, Operations & Troubleshooting Training is a 1-week professional course for artificial lift engineers, production technologists and field operations specialists who design, run and protect downhole pumping assets, concluding with an ESP operational reliability dossier. Harsh wellbores, rising water cuts and gas interference make artificial lift dependability central to field economics. Jupiter Prime Training delivers this course to help technical teams maximise run life across complex completions.

Why Electrical Submersible Pumps ESP Matter Now

Depleting reservoir pressure and increasing multiphase flow demand robust artificial lift configurations that operate without unscheduled intervention. Lifting sour, high-temperature fluids loaded with gas or abrasive solids accelerates motor overheating, cable degradation and mechanical seal failures. Managing these downhole operating envelopes requires rigorous hydrodynamic sizing, electrical system tuning and structured dismantle inspection practices. Engineering teams align these operations against established international frameworks, including the American Petroleum Institute Recommended Practice for Sizing and Selection of Electric Submersible Pump Installations API RP 11S4, ISO 15551-1:2015 for downhole pump design verification, and NACE MR0175 / ISO 15156-1 for sour service metallurgy.

Who Gains Most from Electrical Submersible Pumps ESP

- Engineers responsible for well performance, inflow performance relationship analysis and pump string sizing
- Engineers responsible for electrical power quality, surface drives and variable speed drive commissioning
- Specialists responsible for field surveillance, downhole sensor data interpretation and early failure detection
- Specialists responsible for pull inspection, pump teardown evaluations and root-cause failure analysis
- Supervisors responsible for workover planning, tubing-conveyed pump running and rigless intervention methods

A combined team of production technologists, electrical technicians and asset surveillance engineers gains the most when attending together, establishing a common operational discipline between downhole hydraulic needs and surface electrical control.

Electrical Submersible Pumps ESP Capabilities

Participants move through wellbore hydraulic modelling, downhole component selection, surface drive commissioning and structured mechanical tear-down inspection.

- Calculate total dynamic head and hydraulic lift requirements — artificial lift sizing decisions
- Specify metallurgy and elastomer trim under NACE MR0175 / ISO 15156-1 — sour fluid completion choices
- Select gas separators and multiphase handling stages — high gas-to-oil ratio operating limits
- Assess variable speed drive waveforms and surface power quality — downhole motor thermal management
- Apply dismantle inspection procedures matching API RP 11S1 — downhole failure investigation workflows
- Design rigless deployment and intervention programs — offshore workover rig mitigation choices

Key Electrical Submersible Pumps ESP Terms

- Total Dynamic Head — the net vertical head equivalent required to overcome elevation, tubing friction and surface backpressure.
- Seal Chamber Section — the mechanical protector that equalises internal motor pressure with the wellbore and prevents fluid ingress.
- Motor Lead Extension — the flat low-profile power cable bridging the main electrical cable to the downhole motor pothead.
- Inflow Performance Relationship — the mathematical curve relating wellbore flowing bottomhole pressure to fluid production rate from the reservoir.
- Dismantle Inspection and Failure Analysis — the forensic engineering procedure that examines pulled downhole components to identify root causes of failure.
- Gas Handling Device — a rotary gas separator or multiphase pump stage preventing cavitation and gas locking downhole.

Electrical Submersible Pumps ESP Day by Day

Day 1: Reservoir Inflow and Downhole Hydraulic Sizing

- Inflow Performance Relationship and Nodal Analysis — Determining Operating Inflow Points Under Changing Reservoir Pressures
- Total Dynamic Head and Friction Loss Calculations — Sizing Stage Quantities for Specified Production Objectives
- Pump Performance Curves and Best Efficiency Point — Avoiding Downthrust and Upthrust Damage Regimes Downhole
- Gas-Liquid Ratio and Intake Pressure Constraints — Mitigating Fluid Decapitation and Pump Gas Locking
- Fluid Viscosity and Emulsion Derating Factors — Adjusting Pump Stage Performance for Heavy Crude Conditions

Day 2: Downhole Component Metallurgy and Mechanical Design

- Impeller and Diffuser Geometry Configurations — Selecting Radial Versus Mixed Flow Geometries for Solids Handling
- Seal Chamber Section and Mechanical Seal Arrangements — Isolating Motor Oil from Corrosive Wellbore Fluid Contamination
- NACE MR0175 / ISO 15156-1 Material Selection — Preventing Sulfide Stress Cracking in Sour Fluid Completions
- Induction and Permanent Magnet Motor Ratings — Managing Winding Insulation Classes and Thermal Dissipation Boundaries
- API RP 11S5 Power Cable Sizing — Balancing Dielectric Strength and Armor Integrity for Deep Wells

Day 3: Surface Electrical Architecture and Drive Operations

- Step-Down and Step-Up Surface Transformers — Maintaining Voltage Profiles Across Long Cable Transmission Runs
- Variable Speed Drive Harmonics and Filtering — Reducing Waveform Distortion to Protect Downhole Motor Windings
- Motor Starting Current and Voltage Drop Profiling — Preventing Transient Torque Shocks on Pump Drive Shafts
- Surface Skid Layout and Spacing Parameters — Mitigating Heat Accumulation and Ensuring Safe Maintenance Clearance
- Controller Logic and Trip Alarm Configuration — Preventing Underload Cavitation and Sustained Motor Overcurrent Trips

Day 4: Field Surveillance, Operation and Root Cause Analysis

- Real-Time Downhole Sensor Telemetry Interpretation — Detecting Intake Starvation and Discharge Temperature Spikes Promptly
- Electrical Insulation Resistance Testing Under IEEE Std P43 — Verifying Motor and Cable Integrity Before Startup
- API RP 11S3 Flushing and Running Procedures — Eliminating Debris Damage During Downhole String Installation
- Motor Lead Extension and Penetrator Vulnerability Screening — Mitigating Primary Electrical Failure Modes Across Completions
- API RP 11S1 Teardown Reports and Failure Categorisation — Establishing Evidence Trails for Dismantle Inspection and Failure Analysis

Day 5: Practising the ESP Operational Reliability Dossier

- Multi-Well Hydraulic Re-Sizing Drill — Adjusting Stages for Expected Water Cut Encroachment
- Electrical Power Delivery Audit Simulation — Resolving Surface Voltage Fluctuations and Motor Frequency Shifts
- Downhole Failure Mode Walkthrough — Diagnosing Gas Interference and Mechanical Seal Thermal Breakdown
- Rigless Intervention Feasibility Evaluation — Formulating Alternative Deployment Choices for Remote Completions
- ESP Operational Reliability Dossier Completion — Assembling Final Sizing Curves, Operating Envelopes and Protection Limits

Applying Electrical Submersible Pumps ESP After the Course

- Calculate the actual operating point of an installed pump against its best efficiency point to identify upthrust or downthrust risks.
- Audit pull records and tear-down reports using API RP 11S1 methods to track motor lead extension and penetrator failure frequencies.

Electrical Submersible Pumps ESP Questions FAQ

What are Electrical Submersible Pumps ESP and why do they matter now?

Electrical submersible pumps are multistage downhole centrifugal pumping systems used to lift high-volume production fluids. They matter now because maturing reservoirs, rising water cuts and high gas volumes require precise hydrodynamic and electrical matching to prevent premature pump failure and sustain production targets.

Which roles gain most from Electrical Submersible Pumps ESP?

Production technologists, artificial lift engineers, operations specialists and electrical drive technicians gain the most. The material provides engineering methods for those who model wellbore hydraulics, size equipment strings, configure surface power controllers and investigate downhole failures.

How does Electrical Submersible Pumps ESP differ from general artificial lift training?

General artificial lift training surveys diverse lift methods without detailed electrical or hydrodynamic analysis. This course focuses on electric submersible systems, examining downhole motor heat dissipation, variable speed drive power quality, high-gas multiphase handling and rigorous tear-down failure forensics.

What do participants bring back from Electrical Submersible Pumps ESP?

Participants return with validated calculation workflows for pump sizing, electrical protection templates and an operational reliability dossier. You bring back practical criteria to assess downhole vibration, prevent motor burnouts and establish structured teardown reporting across your field assets.

Electrical Submersible Pumps ESP: The Way Forward

The ESP operational reliability dossier informs the immediate pump selection and electrical setting decisions for upcoming well workovers. Artificial lift leads and production operations teams use it to set operating envelopes and alarming thresholds. After initial runtime data is collected, operational surveillance teams revisit these baseline limits to evaluate motor cooling and head performance under changing reservoir conditions.