Well Stimulation Design: Matrix Acidizing, Hydraulic Fracturing and Acid Fracturing

5 – 16 July 2027
Paris - Right Bank business hotel



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Introduction:

Well stimulation decides whether a damaged or tight well is restored, improved or harmed, and many treatments fail because the damage mechanism, the rock or the placement was misread. This Core Concept course trains engineers to diagnose formation damage and skin, design matrix acidizing treatments for sandstone and carbonate reservoirs in the first week, then design hydraulic fracturing and acid fracturing treatments from in-situ stress, fluid, proppant and DFIT data in the second. Participants finish with a Stimulation Design Package for a case well.

Course Objectives:

- Diagnose formation damage mechanisms, break total skin into its components and estimate the productivity gain a treatment can deliver
- Design sandstone and carbonate matrix acidizing treatments with the right acid systems, stage sequence, additives, diversion and placement method
- Plan acid job execution, spent acid flowback and acid handling safety measures for wellsite operations
- Derive in-situ stress and rock properties to predict fracture orientation, geometry and conductivity targets
- Select fracturing fluids and proppant, build a pumping schedule and interpret mini-frac and DFIT pressure decline data
- Supervise stimulation quality control, evaluate post-treatment results and rank treatments by economic return

Target Audience:

- Production engineers who own well rates and propose remedial treatments for underperforming wells
- Completion engineers who design completions and select stimulation compatible with them
- Reservoir engineers who forecast deliverability and assess stimulation benefits for field plans
- Stimulation and well intervention engineers who design and supervise acid and fracturing jobs
- Petroleum engineers in operator and service company teams who review treatment proposals and post-job reports

Course Outline:

Day 1: Formation Damage Mechanisms and Skin Diagnosis

- Formation Damage Mechanism Catalogue: Fines Migration, Clay Swelling, Scale, Emulsions and Organic Deposits
- Skin Components: Damage, Partial Penetration, Perforation and Turbulence Pseudo-Skin
- Damage Identification from Core Tests, Production History and Buildup-Derived Skin
- Stimulation Ratio Estimate for a Damaged Versus Undamaged Well
- Matrix Versus Fracture Treatment Decision: Below and Above Fracture Pressure Criteria

Day 2: Stimulation Candidate Selection and Sandstone Acid Chemistry

- Candidate Screening Workflow: Permeability, Skin, Reservoir Pressure and Water Proximity
- Sandstone Mineralogy Review: Quartz, Feldspar, Clays and Carbonate Cement Solubility
- HCl Preflush, HF/HCl Main Stage and Overflush Sequence Design
- Secondary and Tertiary Precipitation Risks: Fluosilicates, Iron Hydroxide and Calcium Fluoride
- Retarded and Organic Acid Systems for Sensitive and High-Temperature Sandstones

Day 3: Carbonate Acidizing, Wormholing and Diversion

- HCl Reaction with Limestone and Dolomite and Acid Spending Rate with Temperature
- Wormhole Formation and the Optimum Injection Rate Concept
- Emulsified, Gelled and Viscoelastic Surfactant Acid Systems for Deeper Penetration
- Mechanical and Chemical Diversion: Ball Sealers, Foams, Particulates and Self-Diverting Acids
- Acid Additive Package: Corrosion Inhibitor, Iron Control Agent, Surfactant and Mutual Solvent

Day 4: Acid Job Design, Placement, Flowback and Acid Safety

- Acid Volume and Injection Rate Design Below Fracture Gradient
- Placement Method Selection: Bullheading, Coiled Tubing and Straddle Packer Treatments
- Real-Time Matrix Treatment Monitoring and Skin Evolution Evaluation
- Spent Acid Flowback, Neutralisation and Returned Fluid Sampling
- Acid Handling Safety: HF Exposure, H2S Release, PPE and Spill Response Plan

Day 5: Week-One Case Study: Matrix Acidizing Treatment Proposal

- Case Well Data Review: Logs, Core Mineralogy, Test Results and Completion Records
- Sandstone Well Case: Acid Fluid Selection and Stage Sequence
- Carbonate Well Case: Acid System and Diversion Strategy
- Matrix Treatment Programme: Pump Schedule, Additive Sheet and Contingencies
- Peer Review of Matrix Treatment Proposals Against Success Criteria

Day 6: Rock Mechanics, In-Situ Stress and Fracture Geometry

- Elastic Properties: Young's Modulus and Poisson's Ratio from Core and Sonic Logs
- Minimum Horizontal Stress, Stress Contrast and Fracture Orientation
- Fracture Initiation, Breakdown Pressure and Near-Wellbore Tortuosity
- Two-Dimensional and Pseudo-Three-Dimensional Fracture Geometry Models at Overview
- Fracture Conductivity and Dimensionless Conductivity as Design Targets

Day 7: Fracturing Fluids, Proppant Selection and Pumping Schedule Design

- Slickwater, Linear Gel and Crosslinked Fluid Selection by Proppant Transport Need
- Breakers, Biocides, Buffers and Fluid-Loss Additives in the Fracturing Fluid Recipe
- Proppant Types: Silica Sand, Resin-Coated Sand, Bauxite and Ceramics Against Closure Stress
- Pad Volume, Proppant Concentration Ramp and Flush Volume in the Pumping Schedule
- Screenout Risk Control and Tip Screenout Design for High-Permeability Formations

Day 8: Mini-Frac and DFIT Interpretation, Acid Fracturing and Multistage Completions

- Step-Rate Test and Mini-Frac Sequence Before the Main Treatment
- DFIT Pressure Decline Analysis: Closure Pressure, Leakoff Coefficient and Net Pressure
- Acid Fracturing in Limestone and Dolomite: Etched Conductivity and Leakoff Control
- Acid Fracturing Versus Propped Fracturing Selection by Temperature and Closure Stress
- Multistage Horizontal Well Completions at Overview: Plug-and-Perf and Sliding Sleeve Systems

Day 9: Fracturing Job QA/QC, Real-Time Monitoring and Post-Frac Economics

- Pre-Job QA/QC: Fluid Quality Tests, Proppant Sieve Analysis and Treating Line Pressure Test
- Real-Time Treating Pressure Diagnostics and Net Pressure Plot Interpretation
- Microseismic Mapping and Tracer Methods for Fracture Geometry Confirmation
- Post-Frac Evaluation: Production Response, Pressure Transient Check and Treatment History Match
- Stimulation Economics: Incremental Production, Payout, NPV and Treatment Cost Ranking

Day 10: Capstone: Stimulation Candidate Selection and Treatment Design for a Case Well

- Case Well Screening: Near-Wellbore Damage Versus Low Permeability Diagnosis
- Treatment Selection Across Matrix Acid, Acid Fracture and Propped Fracture Options
- Stimulation Design Package Build: Fluids, Volumes, Pumping Schedule and Placement
- Execution, QA/QC and Flowback Plan with Post-Job Evaluation Criteria
- Stimulation Design Package Presentation and Peer Panel Challenge

Skills You Will Gain:

- Formation Damage Diagnosis
- Skin Decomposition
- Acid System Selection
- Acid Diversion Design
- In-Situ Stress Interpretation
- Pumping Schedule Design
- DFIT Pressure Decline Analysis
- Stimulation Economic Evaluation

Why Attend This Course:

- Take back a Stimulation Design Package that names the treatment, fluids, volumes, placement and evaluation criteria for a case well
- Stop pumping acid or proppant into wells whose problem is low permeability rather than damage, and avoid treatments that leave precipitates behind
- Read treating pressure, mini-frac and DFIT data with confidence when reviewing service company proposals and job reports
- Compare stimulation practice with engineers from operators and service companies working sandstone, carbonate and unconventional reservoirs

Conclusion:

Stimulation pays only when the treatment matches the damage, the rock and the stress field. Week one covers formation damage, skin, candidate selection and matrix acidizing of sandstones and carbonates, with diversion, placement, flowback and acid safety. Week two adds what a matrix course leaves out: rock mechanics, fracture geometry, fracturing fluids and proppant, pumping schedules, DFIT interpretation, acid fracturing, multistage completions, job quality control and post-frac economics. The capstone closes with each participant presenting a Stimulation Design Package for a case well.