CONCEPT

Well Completion Design: Tubing Stress Analysis, Sand Control and Workover Planning

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Introduction:

Well completion design decisions made before the rig arrives fix a well's rate, repair cost and workover frequency for decades: an undersized tubing string, a packer that unseats under thermal load or sand control chosen too late cannot be corrected without a rig. This Core Concept course takes completion, production and drilling engineers through completion type selection, tubing sizing and stress analysis, packers, safety valves, perforating, sand control, intelligent completions and workover planning. Participants build a tubing stress model and write a Completion Program for a deviated case well.

Course Objectives:

- Select the completion type and multi-zone configuration for a well from a documented basis of design and offset well records
- Screen tubing sizes against inflow, outflow and erosional velocity limits and specify tubing grade and connection
- Calculate burst, collapse, axial and triaxial loads for production, shut-in and injection cases, including temperature and ballooning effects
- Specify packers, subsurface safety valves, flow control equipment and completion fluids and calculate tubing movement at the packer
- Design a perforating strategy and select gravel pack, frac pack or standalone screen sand control for the reservoir
- Plan workovers and interventions and write a completion program with running sequence, pressure tests and contingencies

Target Audience:

- Completion engineers who design lower and upper completion strings and select downhole equipment
- Production engineers who specify tubing, sand control and intervention requirements for producing wells
- Drilling engineers who hand wells over for completion and run completion operations from the rig
- Well intervention and workover engineers who plan rig and rigless well repairs
- Petroleum engineers who review completion designs against reservoir and field development requirements

Course Outline:

Day 1: Completion Architecture Selection and Basis of Design

- Completion Basis of Design Document: Reservoir, Fluid and Well Constraints
- Completion Type Decision Matrix: Open Hole, Cased and Perforated, and Liner Completions
- Single, Dual and Stacked Multi-Zone Completion Configurations
- Upper and Lower Completion Interface and Tailpipe Layout
- Offset Well Completion Record Review and Lessons-Learned Log

Day 2: Tubing Sizing and Tubing Stress Analysis

- Tubing Size Screening from Inflow and Outflow Curves and Erosional Velocity Limits
- Burst and Collapse Load Cases for Production, Shut-In and Injection Scenarios
- Axial Load Build-Up: Buoyancy, Piston Force and Helical Buckling
- Temperature and Ballooning Effects on Tubing Length Change
- Triaxial Design Envelope and Design Factor Selection for Tubing Grades and Connections

Day 3: Completion Equipment, Packers, Safety Valves and Fluids

- Permanent and Retrievable Packer Selection by Setting Method and Differential Rating
- Tubing Movement Calculation at the Packer and Expansion Joint Sizing
- Tubing-Retrievable and Wireline-Retrievable Subsurface Safety Valve Setting Depth
- Landing Nipples, Sliding Sleeves, Gauge Mandrels and Flow Couplings in the String Layout
- Completion and Packer Fluid Selection: Brine Density, Crystallisation and Corrosion Inhibition

Day 4: Perforating, Sand Control and Intelligent Completions

- Perforating Strategy: Gun Conveyance, Shot Density, Phasing and Underbalance Design
- Sand Production Prediction and Sand Control Method Selection Criteria
- Gravel Pack and Frac Pack Design: Gravel Sizing and Pumping Schedule
- Standalone Screen Types: Wire-Wrapped, Premium Mesh and Expandable Screens
- Intelligent Completion Overview: Inflow Control Devices, Interval Control Valves and Downhole Gauges

Day 5: Workover Planning and Completion Program Build

- Workover Candidate Review: Tubing Corrosion, Failed Safety Valves and Changed Reservoir Conditions
- Well Kill Method and Intervention Technique Choice: Wireline, Coiled Tubing and Snubbing
- Completion Running Sequence, Pressure Test Programme and Contingency Steps
- Tubing Stress Model Build for a Deviated Producer Case Well
- Completion Program Drafting and Peer Design Review

Skills You Will Gain:

- Completion Type Selection
- Tubing Load Case Analysis
- Triaxial Stress Evaluation
- Tubing Movement Calculation
- Perforating Programme Design
- Sand Control Method Selection
- Workover Scope Planning
- Completion Program Writing

Why Attend This Course:

- Return with a Completion Program and tubing stress model for a deviated case well, already challenged in a peer design review
- Check tubing designs against every load case, not only installation, before tubulars and equipment are ordered
- Reduce early workovers by matching packers, safety valves, sand control and fluids to the full producing life of the well
- Compare completion practice with engineers from operators and service companies working on onshore and offshore oil and gas wells

Conclusion:

A completion string has to survive every load it will see, from running and pressure testing to production, shut-in, stimulation and later workover. The course moves from completion type selection and basis of design through tubing sizing and triaxial stress analysis, packers, safety valves and completion fluids, to perforating, sand control and intelligent completions. The final day applies these methods to workover planning and a deviated case well, producing a tubing stress model and a Completion Program ready for peer design review.