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COURSE BROCHURE

Advanced Nodal Analysis and Network Performance Training Course

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Registered in the United Kingdom and Saudi Arabia

Advanced Nodal Analysis and Network Performance Training Course

Nodal Analysis and Network Performance is a 2-week advanced training course for production, petroleum and well performance engineers that builds a calibrated well-to-separator model and ends with a Network Debottlenecking Case. As mature fields lose reservoir pressure and add wells to crowded gathering systems, the ability to find the true flow restriction decides how much oil and gas reaches the plant. Jupiter Prime Training places nodal modelling at the centre of production optimisation.

Why Nodal Analysis and Network Performance Matters Now

Three forces shape production engineering today: declining reservoir pressure in mature assets, tighter capital for new wells, and the growing use of real-time surveillance data from downhole gauges and multiphase meters. An operator that models inflow, tubing and surface back-pressure together can raise output from existing wells and defer costly compression. One that tunes each well in isolation often moves the bottleneck rather than removing it. The course rests on established inflow performance relationships, multiphase flow correlations and the systems approach to the production circuit from reservoir to export.

Who Gains Most from Nodal Analysis and Network Performance

- Engineers responsible for well test interpretation and inflow models
- Specialists who select tubing, chokes and completion string sizes
- Engineers who screen and size gas lift, ESP or rod pump systems
- Facilities engineers accountable for gathering lines, manifolds and separator pressure
- Surveillance engineers who reconcile allocated and measured rates

Asset teams that send subsurface, well and facilities engineers together gain most, because they leave with one shared model of the circuit.

Nodal Analysis and Network Performance Capabilities

Participants learn to trace pressure loss from the sandface to the separator and to quantify the gain from each change.

- Build and calibrate inflow performance curves from well test data — well rate targets
- Select multiphase flow correlations and match vertical lift performance — tubing and completion design
- Calculate choke and flowline pressure drops under changing water cut — surface operating limits
- Screen artificial lift options against well and reservoir constraints — lift investment decisions
- Test network back-pressure scenarios with linked well models — separator and compression planning
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Communicate debottlenecking options with ranked incremental rates — asset managers and planners

Key Nodal Analysis and Network Performance Terms

- Nodal analysis — A systems method that splits the production circuit at a node and balances inflow against outflow pressure.
- Inflow performance relationship IPR — The curve linking flowing bottomhole pressure to rate the reservoir can deliver into the wellbore.
- Vertical lift performance VLP — The curve showing bottomhole pressure needed to lift a given rate up the tubing to surface.
- Operating point — The intersection of inflow and outflow curves that sets the stable rate and pressure of a well.
- Skin factor — A dimensionless measure of extra pressure loss near the wellbore caused by damage or stimulation.
- Critical flow — Choke flow where downstream pressure changes no longer affect rate through the restriction.

Nodal Analysis and Network Performance Day by Day

Day 1: The Production Circuit as One System

- Reservoir-to-Separator Pressure Budget — Where Pressure Is Spent
- Node Placement Choices — Which Component Is Being Tested
- Fluid Characterisation and PVT Inputs — Model Accuracy Limits
- Black Oil Versus Compositional Description — Fluid Model Selection
- Data Inventory for Well Models — Gaps Before Calibration

Day 2: Reservoir Inflow Behaviour

- Darcy Radial Flow and Productivity Index — Single-Phase Rate Potential
- Vogel and Fetkovich Relationships — Two-Phase Inflow Prediction
- Gas Well Backpressure Equation — Deliverability Forecasts
- Skin Components and Damage Diagnosis — Stimulation Candidate Selection
- Transient Versus Pseudo-Steady Inflow — Test Duration Choices

Day 3: Completion and Near-Wellbore Effects

- Perforation Pressure Drop Models — Shot Density and Phasing
- Gravel Pack and Screen Losses — Sand Control Trade-Offs
- Horizontal and Multilateral Inflow Models — Lateral Length Decisions
- Hydraulic Fracture Productivity Gain — Frac Design Targets
- Commingled Zone Allocation — Crossflow and Zonal Control

Day 4: Multiphase Flow in Tubing

- Flow Regime Maps for Vertical Pipe — Slug and Churn Risk
- Hagedorn-Brown, Beggs-Brill and Mechanistic Correlations — Correlation Choice
- Liquid Holdup and Slip — Gradient Prediction Accuracy
- Liquid Loading in Gas Wells — Critical Velocity Checks
- Tubing Size Sensitivity Runs — Workover Tubing Selection

Day 5: Matching Models to Field Data

- Gradient Survey Matching — Correlation Tuning Factors
- Well Test Rate and Pressure Reconciliation — Calibrated Inflow Curves
- Downhole Gauge Trends — Reservoir Pressure Updates
- Multiphase Meter Versus Test Separator Data — Allocation Confidence
- Match Quality Criteria — When a Model Is Fit for Use

Day 6: Chokes, Flowlines and Surface Restrictions

- Choke Flow Equations and Critical Ratio — Bean Size Selection
- Horizontal and Inclined Flowline Losses — Line Sizing
- Terrain Slugging and Riser Effects — Slug Catcher Duty
- Erosional Velocity Limits — Maximum Allowable Rate
- Wellhead Pressure Constraints — Shut-In and Start-Up Settings

Day 7: Artificial Lift Screening

- Gas Lift Injection Depth and Rate Curves — Lift Gas Allocation
- ESP Pump Curves Within Nodal Models — Stage and Motor Sizing
- Rod Pump and PCP Applicability Envelopes — Low-Rate Wells
- Lift Method Screening Matrix — Selection Under Reservoir Decline
- Lift Energy Use per Barrel — Operating Cost Comparison

Day 8: Gathering Network Modelling

- Linking Well Models to Manifolds — Network Pressure Balance
- Looped and Branched Network Solvers — Convergence Practice
- Separator Pressure Sensitivity — Compression Timing
- Interacting Wells on Shared Lines — Back-Pressure Penalties
- Flow Assurance Constraints in Networks — Hydrate and Wax Margins

Day 9: Optimisation and Forecasting

- Lift Gas and Choke Optimisation Algorithms — Field Rate Maximisation
- Water Cut and GOR Forecast Cases — Future Bottleneck Timing
- Integrated Reservoir-Well-Network Coupling — Plateau Planning
- Uncertainty Ranges on Key Inputs — Robust Option Ranking
- Incremental Rate Economics — Intervention Priority Lists

Day 10: Practising the Network Debottlenecking Case

- Field Model Build from Supplied Well Data — Applying Inflow Methods
- Calibration Against Test and Gauge Records — Applying Matching Criteria
- Choke, Tubing and Lift Scenarios — Applying Sensitivity Runs
- Network Constraint Search — Locating the Limiting Element
- Network Debottlenecking Case — Ranked Options for Asset Review

Applying Nodal Analysis and Network Performance After the Course

- Recalibrate the inflow and VLP models of five priority wells against their latest gauge and test data.
- Run a separator pressure sensitivity across one gathering system and present the rate gain to the facilities lead.

Nodal Analysis and Network Performance Questions FAQ

What is nodal analysis and network performance, and why does it matter now?

It is the systems method of balancing reservoir inflow against tubing and surface outflow to set well rates. It matters now because mature fields need more output from existing wells, and only a linked well and network model shows where pressure is truly lost.

Which roles gain most from nodal analysis and network performance skills?

Production, petroleum and well performance engineers gain most. Facilities engineers who manage gathering lines and separators, and surveillance engineers who reconcile rates, also benefit because they share the same pressure budget from sandface to plant.

How does a nodal analysis and network performance course differ from an artificial lift course?

It covers the whole production circuit rather than one lift method. You model inflow, tubing, chokes, flowlines and networks together, and lift screening is one option among many for removing a bottleneck, not the sole focus.

What do you bring back from nodal analysis and network performance training?

You bring back a calibrated well and network model and a debottlenecking case. It ranks choke, tubing, lift and separator options by incremental rate, ready for discussion with your asset team.

Nodal Analysis and Network Performance: The Way Forward

The Network Debottlenecking Case gives production engineers and asset managers a ranked list of changes, each backed by a calibrated model. Its first use is usually the decision on separator pressure or lift gas allocation. Facilities and well teams then share one reference model. Revisit it each time reservoir pressure, water cut or gas-oil ratio shifts, since the limiting element moves as the field ages.