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COURSE BROCHURE

Compressor Surge Control and Turbine Performance Training Course

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Registered in the United Kingdom and Saudi Arabia

Compressor Surge Control and Turbine Performance Training Course

Compressor Surge Control and Turbine Performance is a 1-week training course for rotating equipment engineers, maintenance supervisors and operations engineers, built around a Train Performance and Surge Margin Sheet for each compressor and turbine train they look after. Throughput targets, fuel and steam costs and tighter emissions limits now push trains closer to their operating limits, so surge events and efficiency drift cost more than before. Jupiter Prime Training delivers this course.

Why Compressor Surge Control and Turbine Performance Matters Now

Three forces shape this subject. Process units run compressors across wider load ranges as feed and demand swing, which erodes surge margin. Energy and carbon pressure turns every point of lost turbine efficiency into a visible operating cost. And a thinner pool of experienced machinery specialists means control settings and performance baselines must be written down rather than held in memory. A surging train damages seals and bearings and can trip a unit. The course rests on asset management practice in ISO 55001 and the maintenance vocabulary of EN 13306.

Who Gains Most from Compressor Surge Control and Turbine Performance

- Engineers responsible for compressor duty points, performance curves and anti-surge loop behaviour
- Supervisors who schedule turbine and compressor overhauls, washes and inspections
- Operations engineers who set load changes, start-ups and recycle valve positions on running trains
- Condition monitoring specialists who read vibration, thrust and temperature trends on turbomachinery
- Control and instrument engineers who maintain surge controllers, transmitters and valve response

Mixed operations, maintenance and control staff from one plant gain most, as surge decisions cross all three.

Compressor Surge Control and Turbine Performance Capabilities

Participants read compressor maps and turbine heat rate together and act on both.

- Calculate polytropic head and efficiency from field readings — overhaul timing decisions
- Specify surge control line offsets and recycle valve response — control engineers and operators
- Assess steam and gas turbine efficiency loss from fouling and wear — wash and inspection scheduling
- Apply vibration and thrust trends to rotor condition — machinery protection settings

- Weigh load-sharing options across parallel compressors — energy and throughput targets
- Communicate train envelope limits — shift teams and process planners

Key Compressor Surge Control and Turbine Performance Terms

- Surge — Flow reversal through a compressor when required head exceeds what the impellers deliver.
- Surge Control Line — A boundary offset from the surge line where the anti-surge controller opens recycle.
- Polytropic Efficiency — Ideal polytropic work divided by actual gas work; it tracks internal compressor condition.
- Heat Rate — Fuel or steam energy used per unit of turbine power output; rising heat rate signals lost efficiency.
- Stonewall — The high-flow limit where gas velocity approaches sonic speed and head falls sharply.
- Turndown — The flow range between surge and stonewall at one speed.

Compressor Surge Control and Turbine Performance Day by Day

Day 1: Train Behaviour and Operating Envelopes

- Centrifugal and Axial Compressor Maps — Reading Surge and Stonewall Limits
- Fan Laws and Speed Lines — Matching Driver Speed to Process Demand
- Gas Composition and Inlet Conditions — Shifts in Head and Capacity
- Steam and Gas Turbine Drivers — Power Margin for Compressor Duty
- Pump and Compressor Drive Trains — Coupling, Gearbox and Shared Lubrication Risks

Day 2: Surge Detection and Anti-Surge Control

- Surge Mechanics and Precursors — Thrust, Temperature and Flow Signals
- Anti-Surge Controller Logic — Control Line Margin and Valve Opening Speed
- Recycle and Blow-Off Valve Sizing — Response Time Against Surge Risk
- Transmitter Placement and Scan Rate — Detection Accuracy on Fast Transients
- Parallel and Series Load Sharing — Avoiding One Machine Pushed to Surge

Day 3: Turbine Performance and Efficiency Loss

- Gas Turbine Heat Rate Tracking — Compressor Washing and Filter Changes
- Steam Turbine Stage Pressures — Locating Deposits and Nozzle Erosion
- Polytropic Head and Efficiency Testing — Trending Compressor Fouling
- Ambient Correction of Performance Data — Fair Comparison Across Seasons
- Governor and Overspeed Protection — Driver Trip Testing Intervals

Day 4: Machinery Health and Maintenance Choices

- Shaft Vibration and Orbit Analysis — Rotor Rub and Instability Diagnosis
- Thrust Bearing Temperature Trends — Surge Damage and Balance Piston Wear
- Dry Gas Seal Monitoring — Seal Gas Supply and Leakage Limits
- Borescope and Hot Section Inspection — Turbine Overhaul Interval Setting
- Pump Cavitation and Minimum Flow — Protecting Auxiliary and Process Pumps

Day 5: Practising the Train Performance and Surge Margin Sheet

- Plotting Field Data on the Compressor Map — Applying Day 1 Envelopes
- Control Line Margin Review on a Case Train — Applying Day 2 Logic
- Wash and Overhaul Trigger Values — Applying Day 3 Efficiency Trends
- Vibration and Seal Alarm Limits — Applying Day 4 Health Signals
- Completed Train Performance and Surge Margin Sheet — Sign-Off by Operations and Maintenance

Applying Compressor Surge Control and Turbine Performance After the Course

- Run a polytropic efficiency test on one critical compressor and set the result as its fouling baseline
- Review surge control line margin and recycle valve stroke time on one train

Compressor Surge Control and Turbine Performance Questions FAQ

What is compressor surge control and turbine performance, and why now?

It is the practice of keeping compressors away from surge and turbines at known efficiency. It matters now because wider load swings and energy costs make surge trips and efficiency drift more expensive.

Who gains most from compressor surge control and turbine performance?

Rotating equipment engineers, operations engineers and maintenance supervisors gain most. Control engineers and condition monitoring specialists also benefit.

How does compressor surge control and turbine performance differ from a general rotating equipment reliability course?

It goes deeper into compressor maps, anti-surge logic and turbine heat rate. A general reliability course spans many machine types and failure analysis.

What do you bring back from compressor surge control and turbine performance training?

You bring back a completed performance and surge margin record for one of your own trains, with margins, baselines and alarm limits.

Compressor Surge Control and Turbine Performance: The Way Forward

The Train Performance and Surge Margin Sheet first informs whether a compressor needs a wash, a control line change or an overhaul. Rotating equipment engineers own it, and operators use it during load changes and start-ups. After the first season of data, revisit the efficiency baseline and the surge margin, because fouling and gas composition move both.