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COURSE BROCHURE

Advanced Turbo Expander Compressor Operation and Overhaul Training Course

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Registered in the United Kingdom and Saudi Arabia

Advanced Turbo Expander Compressor Operation and Overhaul Training Course

Turbo Expander Compressor Operation and Overhaul is a 2-week training course for rotating equipment engineers in ethylene and gas plants who keep expander-compressor sets running in cold sections, and it builds an expander-compressor run and overhaul dossier for each machine. Recovery of refrigeration, product yield and energy now depends on these compact machines staying on line through tighter feed swings and longer run lengths. Jupiter Prime Training delivers this subject for engineers who own expander duty from start-up to teardown.

Why Turbo Expander Compressor Operation and Overhaul Matters Now

Three forces shape expander work today. Feed gas is becoming leaner and more variable, so expanders run further from their design point and inlet guide vanes work harder. Plants are stretching intervals between turnarounds, which puts more weight on bearing condition, seal gas cleanliness and rotor health between inspections. Experienced specialists are retiring while bearing technology shifts from oil films to active magnetic levitation. A plant that reads its expander well keeps cold box temperatures stable and avoids costly flaring; one that does not loses recovery and faces long, unplanned outages. The course rests on ISO 55001 asset management principles and EN 13306 maintenance terminology.

Who Gains Most from Turbo Expander Compressor Operation and Overhaul

- Engineers accountable for expander-compressor availability in demethaniser and cold box trains
- Specialists who set alarm and trip limits for bearings, speed and seal gas
- Engineers who scope, witness and accept expander rotor and cartridge overhauls
- Condition monitoring leads who interpret orbit, axial position and magnetic bearing currents
- Process engineers who tune expander inlet nozzles and recompressor loading for recovery

Plant rotating equipment groups gain most when operations, condition monitoring and overhaul engineers from the same cold section attend together and agree one view of each machine.

Turbo Expander Compressor Operation and Overhaul Capabilities

Participants leave able to read an expander-compressor as one coupled machine, linking cryogenic aerodynamics, bearing behaviour and shop findings to the calls that keep a cold section producing.

- Calculate isentropic efficiency and recompressor power balance from field readings — recovery and energy targets for the cold section
- Assess active magnetic bearing and oil-lubricated bearing condition from orbits, currents and temperatures — run or stop calls
- Specify seal gas supply, filtration and warm-up arrangements for labyrinth-sealed cryogenic shafts — reliability and safe shutdown
- Design start-up, cooldown and trip recovery sequences for expander and recompressor — operations shift supervisors
- Build an overhaul scope covering cartridge, wheels, nozzles and thrust balance — turnaround planners and repair shops
- Communicate expander risk and repair options in plain terms — plant managers and asset owners

Key Turbo Expander Compressor Operation and Overhaul Terms

- Turbo expander compressor — A single-shaft machine where a radial inflow expander drives a compressor wheel, recovering work from high-pressure gas while chilling it.
- Variable inlet nozzles — Adjustable guide vanes around the expander wheel that set flow and pressure ratio as feed conditions change.
- Active magnetic bearing — A bearing that levitates the rotor with controlled electromagnets, removing lube oil and its contamination risk from the cold process.
- Thrust balance — Control of axial load on the rotor, often by adjusting recompressor wheel back pressure, to protect the thrust bearing.
- Seal gas — Clean, warm gas fed to shaft labyrinths to stop cold process gas reaching bearings and keep oil or moisture out.
- Isentropic efficiency — The ratio of actual enthalpy drop across the expander to the ideal drop at the same pressure ratio.

Turbo Expander Compressor Operation and Overhaul Day by Day

Day 1: Cold Section Duty of the Expander

- Ethylene and Gas Plant Cold Box Flow Schemes — Where Expander Duty Drives Recovery
- Joule-Thomson Valve Versus Expander Cooling — Choosing Bypass Strategy During Upsets
- Demethaniser Feed Temperature Targets — Linking Expander Outlet To Product Yield
- Expander-Compressor Datasheet Reading — Confirming Design Point And Operating Envelope
- Machine Criticality Ranking Under ISO 55001 — Setting Attention For Each Set

Day 2: Radial Inflow Aerodynamics

- Velocity Triangles For Radial Inflow Wheels — Predicting Efficiency Away From Design
- Variable Inlet Nozzle Mechanisms — Setting Vane Travel Limits And Linkage Checks
- Two-Phase Expander Exhaust Behaviour — Handling Liquid Formation At The Wheel Outlet
- Isentropic Efficiency From Field Readings — Detecting Wheel Fouling Or Erosion
- Expander Performance Maps — Deciding Re-Rate Versus Wheel Replacement

Day 3: Recompressor Loading and Thrust

- Recompressor Wheel And Diffuser Design — Matching Brake Load To Expander Power
- Speed And Power Balance Calculation — Spotting Overspeed Risk During Feed Swings
- Thrust Balance Valve Control — Keeping Axial Load Inside Bearing Capacity
- Recompressor Recycle And Bypass Lines — Protecting Load During Low Flow
- Coupled Performance Trending — Separating Expander Faults From Recompressor Faults

Day 4: Oil-Lubricated Bearing Systems

- Tilting Pad Journal And Thrust Bearings — Reading Pad Temperatures For Load Shifts
- Lube Oil Console Design — Setting Filtration, Cooling And Accumulator Duty
- Oil Contamination By Process Gas — Choosing Degassing And Sampling Routines
- Rundown Tanks And Emergency Lubrication — Protecting Bearings On Power Loss
- Oil Analysis Trends — Deciding When Bearing Inspection Cannot Wait

Day 5: Active Magnetic Bearing Technology

- Magnetic Bearing Controller And Position Sensors — Interpreting Coil Currents And Gaps
- Auxiliary Landing Bearings — Assessing Rotor Drop Counts And Replacement Timing
- Magnetic Bearing Cooling And Cable Integrity — Preventing Insulation Failure In Cold Duty
- Controller Tuning And Stability Margins — Responding To New Vibration Behaviour
- Oil-Free Conversion Case Review — Weighing Magnetic Retrofit Against Oil Bearings

Day 6: Seal Gas and Cryogenic Shaft Sealing

- Labyrinth Seal Geometry On Cold Shafts — Setting Clearance After Thermal Contraction
- Seal Gas Source, Heating And Filtration — Keeping Bearings Free Of Cold Gas
- Seal Gas Differential Pressure Control — Choosing Alarm And Permissive Values
- Warm Gas Buffering During Standstill — Avoiding Frozen Seals And Ice Ingress
- Seal Leakage Trending — Deciding Between Seal Renewal And Continued Running

Day 7: Control, Protection and Trips

- Expander Inlet Trip Valve And Nozzle Control Loops — Coordinating Fast Unloading
- Overspeed Detection And Voting Logic — Specifying Protection For Light Rotors
- Axial Position And Radial Vibration Limits — Setting Alarm And Trip Bands
- Trip Event Sequence Recording — Reconstructing Causes After An Expander Shutdown
- Cold Section Interaction With Plant Controls — Avoiding Cascade Trips Across Trains

Day 8: Start-up, Cooldown and Recovery

- Pre-Start Permissive Checklists — Confirming Seal Gas, Bearings And Drains Are Ready
- Controlled Cooldown Rates — Limiting Thermal Stress On Casings And Wheels
- Run-Up Through Critical Speeds — Holding Points And Acceptance Readings
- Restart After A Trip — Deciding Inspection Depth Before Return To Service
- Shift Handover Records For Transients — Passing Expander Status Between Crews

Day 9: Overhaul Scoping and Shop Acceptance

- Cartridge Removal And Spare Rotor Strategy — Shortening Expander Downtime
- Wheel, Nozzle And Shroud Inspection Methods — Choosing Repair Or Replacement
- Rotor Balancing And Runout Records — Accepting Rebuilt Rotors From Repair Shops
- Bearing And Seal Clearance Records Under EN 13306 Terms — Documenting As-Left State
- Post-Overhaul Mechanical Run Test — Signing Off Return To Cold Duty

Day 10: Practising the Expander-Compressor Run and Overhaul Dossier

- Field Efficiency And Power Balance Case — Applying Day 2 And Day 3 Methods
- Bearing Fault Diagnosis Exercise — Applying Oil And Magnetic Bearing Evidence
- Trip And Restart Simulation — Applying Protection And Start-up Sequences
- Overhaul Scope Peer Review — Testing Repair Options Against Run Risk
- Expander-Compressor Run And Overhaul Dossier — Completing Limits, Sequences And Scope

Applying Turbo Expander Compressor Operation and Overhaul After the Course

- Recalculate isentropic efficiency and recompressor power balance for each expander set and flag wheels that need inspection at the next outage.
- Walk the start-up and trip recovery sequence with operations crews and correct seal gas and bearing permissives that no longer match the machine.

Turbo Expander Compressor Operation and Overhaul Questions FAQ

What is turbo expander compressor operation and overhaul, and why does it matter now?

It is the discipline of running, protecting and rebuilding the expander-compressor sets that chill gas in cold sections. It matters now because leaner feeds, longer run lengths and the shift to magnetic bearings leave less margin for error on these machines.

Which roles gain most from turbo expander compressor operation and overhaul training?

Rotating equipment engineers responsible for cold section expanders gain most. Condition monitoring leads, overhaul engineers and process engineers tuning nozzles and recompressor load also benefit, especially when they attend as a group from one plant.

How does turbo expander compressor operation and overhaul differ from a general compressor course?

It focuses on one machine type in cryogenic duty rather than process compressors in general. You study radial inflow aerodynamics, magnetic and oil bearings, cold shaft seal gas and expander overhaul instead of broad compressor selection or pipeline duty.

What do you bring back from turbo expander compressor operation and overhaul training?

You bring back a run and overhaul dossier for your own expander sets. It holds efficiency baselines, bearing and seal gas limits, start-up and trip recovery sequences and a scoped overhaul plan your plant can act on.

Turbo Expander Compressor Operation and Overhaul: The Way Forward

The expander-compressor run and overhaul dossier first informs the limits and permissives set on each machine before the next run length. Rotating equipment engineers, operations supervisors and repair shops use it to share one picture of rotor, bearing and seal condition. After the first overhaul, revisit the efficiency baselines and trip records to see whether the scope matched what the teardown revealed.