Cooling Towers and Cooling Water Treatment: Operation, Maintenance and Troubleshooting

4 – 8 January 2027
Dubai - Five-star CBD venue



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Introduction:

Cooling towers in refineries, power stations, petrochemical and manufacturing plants often lose capacity without anyone noticing: fill scales or clogs, nozzles block, fans run off pitch, cycles of concentration drift and biofilm builds in the basin. The result is higher cold water temperature, lost production, wasted make-up water and Legionella exposure. This Core Concept course gives utility, operations and water treatment teams the methods to read tower performance, run the circulating water chemistry, test, inspect and troubleshoot cooling towers. Participants build a Cooling Tower Performance and Water Management Plan for their own site.

Course Objectives:

- Calculate range, approach, heat load and liquid-to-gas ratio from site readings and wet-bulb data to judge cooling tower capability
- Inspect fill, distribution systems, drift eliminators, fans, gearboxes and drive shafts against condition criteria and record defects
- Control cycles of concentration, blowdown, scaling, corrosion and biofouling through a documented cooling water treatment programme
- Apply a written Legionella risk control scheme covering monitoring, sampling, cleaning and disinfection of cooling towers
- Diagnose high cold water temperature, water losses and mechanical faults and select corrective actions
- Produce a Cooling Tower Performance and Water Management Plan with water and fan energy saving measures for their own site

Target Audience:

- Utility and operations engineers responsible for cooling tower cells, circulating water pumps and cold water temperature targets
- Maintenance engineers and supervisors responsible for fans, gearboxes, fill and structural repairs on cooling towers
- Water treatment and laboratory staff responsible for chemical dosing, blowdown control and water quality monitoring
- Shift operators and technicians responsible for daily tower rounds, log sheets and basin checks
- Reliability and energy engineers responsible for tower performance, water use and fan power consumption

Course Outline:

Day 1: Cooling Tower Fundamentals and the Site Baseline

- Evaporative Heat Rejection: Latent and Sensible Heat Transfer at the Air-Water Interface
- Wet-Bulb and Dry-Bulb Readings on the Psychrometric Chart for Tower Duty
- Natural Draft, Induced Draft and Forced Draft Tower Arrangements
- Counterflow Versus Crossflow Water and Air Paths and Their Operating Trade-Offs
- Tower Baseline Survey: Cell Register, Design Data Sheet and Log Sheet Review

Day 2: Thermal Performance and Tower Components

- Range, Approach and Heat Load Calculation from Field Readings
- Liquid-to-Gas L/G Ratio and Its Effect on Cold Water Temperature
- Splash Fill Versus Film Fill: Fouling Tolerance and Replacement Criteria
- Hot Water Basins, Spray Nozzles and Drift Eliminator Condition Checks
- Fan, Gearbox, Drive Shaft and Motor Assembly with Vibration Cut-Out Switches

Day 3: Cooling Water Chemistry and the Treatment Programme

- Evaporation, Drift and Blowdown Water Balance with Make-Up Metering
- Cycles of Concentration Calculation and Conductivity-Controlled Blowdown Setpoints
- Scaling Indices and Calcium Carbonate and Silica Scale Control with Inhibitors
- Corrosion Coupons and Inhibitor Dosing for Mixed-Metal Circulating Circuits
- Oxidising and Non-Oxidising Biocide Programmes with Dip Slide Monitoring

Day 4: Legionella Control, Performance Testing and Troubleshooting

- Legionella Risk Assessment, Written Control Scheme and Sampling Plan
- Cleaning and Disinfection Procedure for Basins, Fill Packs and Distribution Decks
- Thermal Performance Test Procedure: Instrument Placement, Test Conditions and Capability Result
- High Cold Water Temperature Diagnosis: Plume Recirculation, Fill Blockage and Uneven Distribution
- Mechanical Fault Diagnosis: Gearbox Oil Analysis, Fan Blade Pitch and Shaft Misalignment

Day 5: Inspection Walkthrough and the Cooling Tower Performance and Water Management Plan

- Inspection Walkthrough Checklist: Structure, Casing, Fill, Eliminators, Basin and Fan Deck
- Petrochemical Case: Rising Approach Traced to Scaled Fill and Blocked Nozzles
- Power Station Case: Condenser Backpressure Linked to Tower Capacity Shortfall
- Savings Options Appraisal: Variable Speed Fans, Side-Stream Filtration and Alternate Make-Up Sources
- Cooling Tower Performance and Water Management Plan Build and Peer Review

Skills You Will Gain:

- Tower Thermal Performance Analysis
- Psychrometric Calculation
- Fill and Drift Eliminator Inspection
- Fan and Gearbox Condition Assessment
- Cooling Water Chemistry Control
- Blowdown Optimisation
- Legionella Risk Management
- Cooling Tower Troubleshooting

Why Attend This Course:

- Return with a Cooling Tower Performance and Water Management Plan built from your own site's tower data and water readings
- Recover lost cooling capacity by tracing high approach to fill, distribution, airflow or mechanical causes before the hot season
- Cut make-up water, chemical and fan power costs with measures you can justify to plant management using water balance figures
- Compare cooling tower and water treatment practice with peers from refining, power, petrochemical and manufacturing plants

Conclusion:

A cooling tower that is measured, treated and inspected against clear criteria holds its cold water temperature and wastes little water. The week moves from evaporative heat rejection, psychrometrics and tower types, through range, approach, fill and mechanical components, to cooling water chemistry, blowdown and Legionella control, then to performance testing and troubleshooting. The final day applies these in an inspection walkthrough and case work, producing a Cooling Tower Performance and Water Management Plan ready for the next plant review.