CONCEPT

Drinking Water Treatment and Groundwater Management: Sources, Well Fields and Chlorination



Drinking Water Treatment and Groundwater Management: Sources, Well Fields and Chlorination

Introduction:

Drinking water treatment fails quietly when well fields are over-pumped, aquifers are left unprotected, coagulant doses lag behind raw water changes and chlorine residuals fade before water reaches the far end of the network. This Core Concept course gives utility operators, engineers and water quality staff a practical method to assess groundwater and surface sources, run aeration, coagulation, clarification and filtration, control chlorination and keep storage and distribution hygienic. Participants finish with a Source-to-Tap Treatment Barrier and Water Safety Plan Review for their own supply system.

Course Objectives:

- Assess groundwater, surface water and blended sources for hazards and describe the treatment barriers each source requires
- Monitor well field water levels and quality and apply well performance checks and wellhead protection measures
- Operate aeration, coagulation, flocculation, sedimentation and filtration stages to hold treated water turbidity, iron and manganese within target
- Control chlorination using contact time, residual testing and precursor management to balance disinfection against by-product formation
- Run chlorinators, dosing pumps, booster pumps and valves and inspect reservoirs and storage tanks for hygiene defects
- Compile a Source-to-Tap Treatment Barrier and Water Safety Plan Review with sampling points, control limits and corrective actions

Target Audience:

- Treatment works operators responsible for running aeration, clarification, filtration and chemical dosing on shift
- Well field and borehole operators responsible for pumping schedules, water level readings and wellhead condition
- Process engineers responsible for treated water output, chemical consumption and treatment stage performance
- Water quality and laboratory staff responsible for sampling, field testing and reporting of drinking water results
- Network and reservoir supervisors responsible for storage hygiene, chlorine residuals and distribution flushing

Course Outline:

Day 1: Drinking Water Sources, Quality Parameters and Supply Baseline

- Groundwater, Surface Water and Desalinated Blend Characteristics at Overview
- Source Vulnerability Survey: Catchment, Wellhead and Intake Hazard Checklist
- Drinking Water Quality Parameter Groups: Microbial, Chemical, Radiological and Acceptability
- WHO Guidelines for Drinking-water Quality: Health-Based Targets and Guideline Value Structure
- Source-to-Tap Block Diagram and Multiple Barrier Baseline

Day 2: Groundwater Resources, Well Field Management and the Water Safety Plan

- Aquifer Types, Recharge and Drawdown Cone Concepts for Well Field Staff
- Groundwater Monitoring Network: Piezometers, Data Loggers and Water Level Trend Charts
- Well Performance Checks: Specific Capacity, Step-Drawdown Test and Rehabilitation Triggers
- Wellhead Protection Zones and Aquifer Contamination Prevention Measures
- WHO Water Safety Plan Steps: Team, System Description, Hazard Analysis and Control Measures

Day 3: Potable Treatment Processes From Aeration to Filtration

- Aeration and Oxidation for Iron, Manganese and Hydrogen Sulphide Removal
- Coagulant Dose Selection by Jar Testing and Flocculator Mixing Adjustment
- Clarifier Operation: Sludge Blanket Control and Desludging Routine
- Rapid Gravity and Pressure Filter Running: Head Loss, Backwash Sequence and Filtered Turbidity
- Lime Softening, Ion Exchange, Activated Carbon and Membrane Filtration Selection at Overview

Day 4: Disinfection, Chlorination Control and Equipment Faults

- Chlorine Chemistry: Hypochlorous Acid, Hypochlorite Ion and the pH Effect
- Concentration Times Contact Time CT Principle and Contact Tank Baffling
- Free and Total Chlorine Residual Control With DPD Field Testing Across the Network
- Disinfection By-Products: Trihalomethanes, Haloacetic Acids and Organic Precursor Reduction
- Chlorinator, Dosing Pump, Booster Pump and Control Valve Fault-Finding Chart

Day 5: Treatment Works Inspection Walkthrough and Water Safety Review

- Guided Walkthrough of a Case Well Field and Treatment Works Against a Barrier Checklist
- Reservoir and Storage Tank Hygiene Inspection: Hatches, Vents, Sediment and Cleaning Records
- Sampling and Laboratory Testing Plan Build: Points, Frequencies and Chain of Custody
- Incident Case: Turbidity Spike and Coliform Detection Response Sequence
- Source-to-Tap Treatment Barrier and Water Safety Plan Review Drafting and Peer Review

Skills You Will Gain:

- Source Hazard Assessment
- Well Field Monitoring
- Aquifer Protection Planning
- Jar Test Interpretation
- Filter Backwash Control
- Chlorine Residual Management
- Disinfection By-Product Control
- Water Quality Sampling Design

Why Attend This Course:

- Return with a Source-to-Tap Treatment Barrier and Water Safety Plan Review built around your own wells, works and reservoirs
- Spot falling well yields, rising filtered turbidity and fading chlorine residuals before customers or laboratory results expose them
- Explain treatment and disinfection decisions to managers and auditors using clear control limits and records
- Compare practice with peers running groundwater, surface water and blended supplies for cities, industry and remote communities

Conclusion:

Safe drinking water depends on protecting the source, running each treatment barrier within limits and keeping disinfection effective all the way to the tap. The one week move from sources and quality parameters, through groundwater and well field management and the water safety plan, to aeration, coagulation, clarification and filtration, then to chlorination control, by-products and equipment faults. The final day applies these methods in an inspection walkthrough and closes with a Source-to-Tap Treatment Barrier and Water Safety Plan Review.