



The Water Treatment Series consists of seven core subject areas necessary to achieve the requisite competency for further specialization.

## Water Treatment Overview

### Water Treatment Plant Operation Overview

- Water Treatment Overview
- Industrial Applications
- Water Treatment Stages
- Plant Operator Duties

### Water Sources and Quality

- Water Sources
- Evaluation Procedures
- Water Quality Problems
- Water Treatment Processes

### Water Analysis

- Alkalinity/Acidity -pH
- Chlorine
- Hardness
- Jar Test
- Temperature and Turbidity

### Water Treatment Analytical and Control Equipment

- Purpose of Analytical and Control Equipment
- Types of Analytical and Control Equipment
- Industrial Applications

### Handling and Disposal of Process Wastes

- Properly and Safely Discharging Wastes
- Sources of Plant Wastes
- Sedimentation Tanks
- Recovery Ponds and Sludge Drying Beds
- Sludge Handling Equipment

## Water Treatment Processes

### Coagulation, Flocculation, and Agglomeration

- Coagulation, Flocculation, and Agglomeration
- Major Components
- Theory of Operation
- Selection Criteria
- Sampling

### Sedimentation

- Sedimentation Basins
- Theory of Operation for Sedimentation Basins
- Factors That Affect Performance
- Sampling and Analysis

### Disinfection

- Disinfection Processes
- Selection Criteria
- Chlorination
- Ultraviolet (UV) Systems
- Ozone Systems

### Water Softening

- Introduction to Water Softening
- Water Softening Terminology
- Major Water Softening Components
- Theory of Operation for Water Softening Systems
- Common Water Softening Applications

### Demineralization

- Demineralization Overview
- Types of Demineralization Processes
- Major Demineralization Components
- Theory of Operation for Demineralization Processes
- Advantages and Disadvantages of

Demineralization

## **Water Dealkalization**

- Introduction to Water Dealkalization
- Major Water Dealkalization Components
- Theory of Operation for Water Dealkalization
- Industrial Water Dealkalization Applications

## **Filtration**

- Introduction to Water Filters
- Factors that Affect the Filtration Process
- Theory of Operation for Filtration

## **Ultra Filtration**

- Ultra Filtration Overview
- Membrane Methods
- Major Ultra Filtration Components
- Theory of Operation for Ultra Filtration Processes

## **Reverse Osmosis**

- Introduction to Reverse Osmosis
- Principles of Reverse Osmosis
- Advantages and Disadvantages of Reverse Osmosis
- Industrial Reverse Osmosis Applications

## **Ion Exchange**

- Ion Exchange Overview
- Types of Ion Exchangers
- Major Ion Exchanger Components
- Theory of Operation for Ion Exchanger
- Industrial Ion Exchange Applications

## **Electronic Deionization**

- Advantages of Electronic Deionizers
- Major Electronic Deionizer Components

- Theory of Operation for Electronic Deionizers
- Electronic Deionizer Maintenance
- Industrial Electronic Deionizer Applications

## **Distillation**

- Introduction to Distillation
- Principles of Distillation
- Industrial Distillation Applications
- Advantages and Disadvantages of Distillation

## **Electrolysis**

- Electrolysis Overview
- Principles of Electrolysis
- Industrial Electrolysis Applications
- Advantages and Disadvantages of Electrolysis

## **Desalination**

- Introduction to Desalination
- Methods and Techniques
- Monitored Parameters
- Industrial Desalination Applications

## **Cooling Water Treatment**

### **Corrosion Theory**

- Corrosion Overview
- Causes of Corrosion
- Problems Caused by Corrosion
- Methods of Corrosion Control

### **Microbiological Problems**

- Microbiological Contamination
- Types of Bacteria and Microorganisms
- Microbiological Hazards
- Microbiological Treatment Processes

## Plugging and Fouling

- Introduction to Plugging and Fouling
- Common Problems
- Organic Foulants
- Treatment Processes

## Scaling

- Scaling Overview
- Common Problems
- Types of Scales
- Insulating Effects
- Methods of Scaling Control

## Cooling Water System Test Parameters

- Purpose of Test Parameters
- Overview of Parameters
- Types of Testing Equipment
- Interpreting Results

## Boiler Water Treatment

### Boiler Water Problems

- Introduction to Boiler Water Treatment
- Boiler Water Impurities
- Steamflow Schematics
- Common Problems
- Prevention Methods

### Water Treatment for Corrosion Control

- Chemical Selection Criteria
- Chemical Dosage
- Chemical Corrosion
- Cathodic Protection Control

## Water Treatment for Scale Control

- Introduction to Scale
- Effects of Scale
- Treatment Methods
- Chemical Selection Criteria

## Water Treatment for Carryover Control

- Causes of Carryover
- Effects of Carryover
- Prevention Methods

## Phosphate Control

- Phosphate Hideouts
- Excess Phosphate Problems
- Phosphate Control Methods

## Boiler Water Treatment Control Programs

- Polymer Programs
- Steam and Condensate System Control
- Feed Testing and Control
- Bleedoff Control
- Boiler Water Limits

## Boiler Water Test Methods

- Analysis Methods and Equipment
- Water Sample Preparation
- Tested Parameters
- Interpreting Results

## Drinking Water Treatment

### Reservoir Management

- Reservoir Management Overview
- Factors that Affect Water Quality
- Reservoir Management Programs

- Laboratory and Monitoring Programs
- Record Keeping Methods

## **Intake Structures**

- Introduction to Intake Structures
- Types of Intake Structures
- Safe Operation and Maintenance

## **Taste and Odor Control**

- Taste and Odor Control Overview
- Causes of Taste and Odor
- Sources of Taste and Odor
- Taste and Odor Elimination
- Monitoring and Control Programs

## **Plant Operation**

- Overview of Plant Schematics
- Flow Regulation and Chemical Dosages
- Operating and Maintenance Procedures
- Emergency Response Conditions
- Energy Conservation Measures

## **Fluoridation**

- Fluoridation
- Fluoridation Compounds
- Operation of Fluoridation Equipment
- Using Log Sheets
- Safety Requirements

## **Lead Control**

- Introduction to Lead Control
- Lead and Copper Rule
- Health Hazards of Lead Contamination
- Lead Control Methods

## **Iron and Manganese Control**

- Introduction to Iron and Manganese Control

- Iron and Manganese Control Processes
- Troubleshooting Red Water Problems

## **Trihalomethanes and Arsenic Control**

- Introduction to Trihalomethanes and Arsenic
- Causes of Trihalomethanes and Arsenic in Water
- Trihalomethane Control Processes
- Arsenic Removal Methods
- Residual Disposal

## **Water Distribution**

### **Storage Tanks**

- Purpose of Storage Tanks
- Types of Storage Tanks
- Operation and Maintenance
- Storage Tank Standards
- Operator Duties

### **Storage Facilities**

- Purpose of Storage Facilities
- Types of Storage Facilities
- Location Selection Criteria
- Storage Facility Requirements

### **Distribution Facilities**

- Purpose of Water Distribution Systems
- Backflow Prevention Devices
- Distribution Facility Water Contamination Sources
- Operator Duties

## Wastewater Treatment

### Wastewater Treatment Basics

- Wastewater Overview
- Wastewater Treatment Plants
- Wastewater Treatment Processes
- Wastewater Terminology
- Disposal and Reuse of Solids

### Preliminary Treatment

- Introduction to Preliminary Treatment
- Preliminary Treatment Equipment
- Stages of Preliminary Treatment
- Theory of Operation for Preliminary Treatment Processes
- Operator Duties

### Primary Treatment

- Introduction to Primary Treatment
- Primary Treatment Terminology
- Primary Treatment Equipment
- Theory of Operation for Primary Treatment Processes
- Operator Duties

### Intermediate Treatment

- Dissolved Materials Removal
- Dissolved Air Flotation
- Operation of Dissolved Air Flotation Tanks
- Saponification

### Secondary Treatment

- Common Terminology for Secondary Treatment
- Secondary Treatment Systems
- Activated Sludge Process
- Microorganisms

- Sludge Handling Methods

### Tertiary Treatment

- Filtration in Tertiary Treatment
- Activated Carbon Adsorption
- Quality Standards

### Operator Responsibilities

- Operator Checks
- Sampling and Analysis
- Safety in Wastewater Treatment
- Process Variables
- Common Operator Terminology

### Phosphorus Removal

- Phosphorus Removal Systems
- Theory of Operation for Phosphorus Removal Systems
- Sampling Methods
- Corrective Actions

### Nitrogen Removal

- Nitrogen Removal Systems
- Theory of Operation for Nitrogen Removal Systems
- Suspended Growth vs. Fixed Film Reactors
- Ammonia Stripping, Breakpoint Chlorination, and Ion Exchange

### Enhanced Biological Nutrient Removal

- Enhanced Biological Nutrient Removal
- Common Terminology
- Optimization Techniques and Processes
- Operation and Maintenance