



A Non-Profit Educational Corporation

OCT ACADEMY
A U.S. Government Funded Education Contractor.
An ANSI/IACET Accredited School Nationwide.
Class Description submittal to OESAC

Title: **Water Treatment Operations**

New Class, or **Class Renewal**

CEU Award requested: **1.4 CEUs**

OVERVIEW:

This two (2)-day foundation class is a must attend session for all water treatment operators, especially entry level operators. All component plant processes and functions are clearly identified, then described from raw water intake to finished water clear well storage. Surface treatment processes are reviewed beginning with the general vocabulary of the treatment industry, water chemistry, and the various techniques of water treatment.

CLASS DESCRIPTION:

These sessions are designed to provide a basic knowledge foundation about the processes utilized to treat raw water and prepare attendees for the questions and problems they will encounter at work and in a water plant operator certification exam.

OUTLINE:

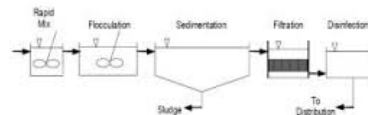
Surface Water Plant Operation

1. **Introduction and Glossary:**
Goals
Glossary of Words and Terms

2. **Conventional Surface Water Treatment:**
Plant Configuration
Surface Water Plant Flow Sheet
Application Points For Chemicals
Conventional, Direct and Alternative
Filtration Configurations

3. **Flash Mixing of Coagulants:**

Conventional Surface Water Treatment for Drinking Water

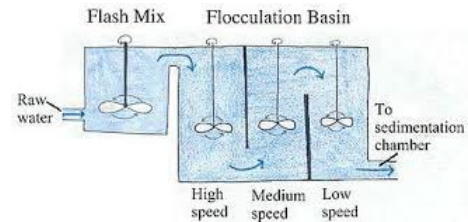


Clarifying Equipment Components
Chemical Oxidants
Flash Mixing - Propeller / Motionless
Liquid Chemical Feed Pumps
Dry Feeders - Gravimetric / Volumetric
Color and Turbidity Removal
Primary Coagulants
Factors Influencing Coagulation
Alkalinity Factors
Coagulant Dosage - pH Domains

4.

Flocculation:

Process Monitoring
Guideline and Sampling
Proper Floc
Floc Identification -
Influencing Factors
Typical Flocculator
Equipment
Jar Testing
Charged Particles (Cations and Anions)
Quiz - Coagulation and Flocculation



5.

Sedimentation:

Theory of Sedimentation
Settling Zones
Ideal Sedimentation Basins
Sedimentation Patterns
Overflow Rates
Floc Carryover
Type of Clarifiers
Operational Problems
Design Criteria (Alum Floc)
Surface Settling Rate
Detention Time
Weir Overflow Rate
Horizontal Velocity
Tube Settlers
Quiz - Sedimentation



Sedimentation Tank

6.

Filtration:

Conventional Surface Water Turbidity
Removal Filtration System
Effluent Turbidity Standards
Gravity Filter System Components
Surface Wash Units
Filtration Theory
Rapid Sand / Mixed Media Filters
Filter Media Configurations
Service Run Vs. Headloss
Declining Rate Vs. Constant Rate Filtration
Mixed Media Backwash Rates
Filtration Rates
Backwash Rates
Filter Operation Records
Filter Problems and Corrective
Measures
Iron and Manganese Removal
Slow Sand Filters
Sand Pressure Filters
Diatomaceous Filters
Quiz – Filtration



Filtration Gallery

7. **Water Disinfection & Chlorine Chemistry**
Identify 2 disinfection processes
Identify atomic, molecular, physical & chemical processes
Name the common chlorine-based disinfectants
Identify water chemistry of different chlorine-based disinfectants
Compare free, combined & total chlorine
Identify correct correlation between chlorine demand & breakpoint chlorine
Name 3 effects of pH, temperature, contact time with regard to chlorination
Describe formation of various DBPs
Methodologies for applying disinfectants
Chemistry

8. **Water Softening:**
Ion Exchange
Lime - Soda Ash Softening

9. **Membrane filtration:**
Quiz - Membranes

10. **Laboratory**

Compliance with Total Coliform Rule
Explain how coliform samples are collected
Calculate C·T values for inactivation of viruses
Describe chlorine level detection
Explain jar testing for process control

11. **Chemicals**

Types of chemicals used in treatment
How chemicals are used in treatment processes
Describe properties of common types of treatment chemicals
Identify quality factors & source contaminants

12. **Regulations**

Explain the purpose of SDWA
List general requirements of Surface Water Treatment Rule
Differentiate between primary and secondary drinking water regulations
Explain federal drinking water enforcement at state level
Discuss major compliance requirements for treatment plants

DETAILED SUPPORTING DESCRIPTION:

The primary function of water treatment is to provide drinking water that is Safe from contamination and will not cause waterborne disease. A water supply that is considered safe to drink is called POTABLE. A secondary reason that water is treated is to remove objectionable materials or possibly change the characteristics of the water source to make it more acceptable to the consumer. Drinking water that “tastes good” and is acceptable to the consumer is called PALATABLE. The major objectives of water treatment are to produce a water supply that is both potable and palatable.

These characteristics of the water source can be broken down into three (3) basic categories: physical, chemical and biological characteristics.

Physical Characteristics:

The physical characteristics of water include TURBIDITY, color, temperature, taste and odor. These characteristics may not cause the water source to be unsafe to drink, but might still be objectionable to the consumer. Physical characteristics relate to the sensory qualities of water.

Chemical Characteristics:

Chemical differences between two (2) water sources include mineral content and the presence or absence of chemical compounds such as calcium, magnesium, iron, fluoride and other naturally occurring compounds. Man-made chemical contaminants including industrial chemicals, pesticides, and other organic chemical must also be removed.

The chemical stability of the water may also need to be controlled. The measure of the BASE or ACID characteristic of water is called pH. ALKALINITY is the

naturally occurring buffering capacity of the source water. In Oregon, natural water characteristics or chemical treatment may require pH adjustment to insure a pH neutral or stable product water that will flocculate.

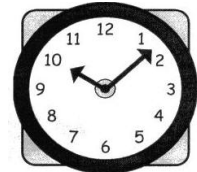
Biological Characteristics:

The presence of organisms such as BACTERIA, VIRUS, PROTOZOANS, ALGAE, and others, make up biological characteristics of water. One of the operator’s most important roles in water treatment is to deliver water that is free from disease- causing or PATHOGENIC organisms. Adequate chemical treatment and filtration will remove these organisms. Other organisms and their by-products may play a role in modifying both the physical and chemical characteristics of the water.

A Fourth (4th) Characteristic:

Radiological factors may have to be considered because there is the possibility that the water may have come in contact with radioactive substances. This is become a somewhat new area for the water treatment process. Maximum permissible concentrations of radioactivity are measured in terms of alpha and beta particle activity.

TIME PRESENTATION SCHEDULE:



Day 1

Start Time	End Time	Instructional Time	Allotted Break Time	Chapter/Discussion/Quiz
8:00am	8:50am	50 minutes	8:50am–9:00am	Introduction, Glossary of Words and Terms
9:00am	9:50am	50 minutes	9:50am–10:00am	Glossary Words & Terms Continued
10:00am	10:50am	50 minutes	10:50am-11:00am	Chapter 1 – The need for Treatment of Water Sources
11:00am	12:00pm	60 minutes	12:00pm-12:30pm	Chptr 2 – Conventional Surface Water Treatment Plant Configuration & Chptr 3 – Flash Mixing & Coagulation
12:30pm	1:20pm	50 minutes	1:20pm-1:30pm	Chapter 4 – Flocculation
1:30pm	2:20pm	50 minutes	2:20pm-2:30pm	Chapter 5 – Sedimentation
2:30pm	3:20pm	50 minutes	3:20pm-3:30pm	Chapter 6 – Filtration
3:30pm	4:30pm	60 minutes		Chapter 6 – Filtration Continued
		420 minutes		

6 sessions of 50 minutes of instruction and 2 sessions of 60 minutes of instruction equals 420 minutes. 420 minutes equates to 7 hours of instruction divided by 10 which is 0.7 CEUs

Day 2

Start Time	End Time	Instructional Time	Allotted Break Time	Chapter/Discussion/Quiz
8:00am	8:50am	50 minutes	8:50am–9:00am	Chapter 7 – Disinfection and Chlorine Chemistry
9:00am	9:50am	50 minutes	9:50am–10:00am	Chapter 8 – Water Softening
10:00am	10:50am	50 minutes	10:50am-11:00am	Chapter 8 – Water Softening Continued
11:00am	12:00pm	60 minutes	12:00pm-12:30pm	Chapter 9 – Membrane Processes
12:30pm	1:20pm	50 minutes	1:20pm-1:30pm	Chapter 10 – Laboratory
1:30pm	2:20pm	50 minutes	2:20pm-2:30pm	Chapter 11 – Chemicals
2:30pm	3:20pm	50 minutes	3:20pm-3:30pm	Chapter 12 – Water Regulations
3:30pm	4:30pm	60 minutes		Chapter 12 – Water Regulations Continued
		420 minutes		

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END