Water Treatment Plant Operation, Volume I
Office of Water Programs
California State University, Sacramento
(9.0 Continuing Education Units)

Objective

This course is designed to train operators to safely and effectively operate and maintain drinking water treatment plants.

Scope

This course is designed to train operators in the practical aspects of operating and maintaining water treatment plants with an emphasis on safe practices. The material presented includes an introduction to water treatment plants, the role of the operator, source water, reservoir management, and intake structures. Learn how to safely operate and maintain coagulation, flocculation, sedimentation, filtration, and disinfection processes. Also discussed are methods to control tastes and odors in drinking water, control corrosion to meet Lead and Copper Rule requirements, perform basic water laboratory procedures, and complete math calculations commonly used in plant operation. This course covers: daily operating procedures, regulation of flows, chemical use and handling, records and reports, plant maintenance, safety, emergency conditions and procedures, handling complaints, and energy conservation. The goal is to provide operators with an understanding of basic water treatment plant operational concepts and practices, and with the ability to recognize, analyze, and solve problems when they occur.

Course Outline:

The course uses *Water Treatment Plant Operation,* Vol. I training manual.

Chapter 1. Introduction to Water Treatment

1. Discuss the need for, uses of, and regulations governing the production of safe, pleasant drinking water.
2. Explain the flow pattern through conventional surface water treatment plants.
3. Use daily operating procedures to safely operate and maintain a water treatment plant by regulating flows, applying chemicals and adjusting doses, maintaining equipment and facilities, and responding to emergency conditions.
4. Communicate operational information using verbal and written reports and records.
5. Implement energy conservation measures.

Water Treatment Plant Operation, Vol. I, 7th edition, 2017
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Chapter 2. Source Water, Reservoir Management, and Intake Structures

1. Use a sanitary survey to evaluate the suitability of an identified water source for drinking purposes and as a general water supply.
2. Develop and implement a reservoir management program using identified water quality problems and data from laboratory and monitoring programs.
3. Identify various types of intake structures, gates, and screens and describe their purposes.
4. Safely operate, maintain, and troubleshoot intake facilities.
5. Record necessary information on the operation and maintenance of reservoir water quality management programs and intake structures.

Chapter 3. Coagulation and Flocculation

1. Safely start up, operate, maintain, and shut down coagulation and flocculation processes, including ballasted flocculation.
2. Select appropriate chemicals and dosages and adjust chemical feed rates using data from jar tests and other laboratory tests performed on water samples collected from coagulation and flocculation basins.
3. Use process data and observations to adjust process variables, including the speed of flash mixers and flocculators, to obtain optimal process performance.

Chapter 4. Sedimentation

1. Identify factors affecting the performance of sedimentation basins using results from observations, samples, laboratory tests, and records.
2. Describe various types of sedimentation basins and how they work.
3. Safely start up, operate, maintain, and shut down sedimentation basins and processes.

Chapter 5. Filtration

1. Describe the various types of potable water filters and how they work.
2. Explain how other treatment processes affect the performance of the filtration process.
3. Operate and maintain filters under normal and abnormal process conditions.
4. Start up and shut down filtration processes.
5. Safely perform duties related to the various types of filters.

Chapter 6. Disinfection

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1. Explain the disinfection process using chlorine, hypochlorite, chlorine dioxide, and chloramines as well as ultraviolet (UV) and ozone systems.
2. Describe the breakpoint chlorination process.
3. Identify the points of disinfectant application and select the proper dosage.
4. Start up, shut down, troubleshoot, and maintain disinfection equipment and systems.
5. Handle disinfectants safely and develop and conduct a chlorine safety program.

Chapter 7. Corrosion Control

1. Recognize adverse effects of corrosion and describe how a pipe corrodes.
2. Determine if corrosion problems exist in your system.
3. Determine if a water is saturated with calcium carbonate.
4. Control corrosion using proper chemicals and dosage and cathodic protection.
5. Prevent soil corrosion (external corrosion).
6. Troubleshoot and solve corrosion problems.
7. Explain and implement the Lead and Copper Rule.

Chapter 8. Taste and Odor Control

1. Identify causes and locate sources of tastes and odors.
2. Prevent the development of tastes and odors.
3. Treat or eliminate tastes and odors.
4. Develop a taste and odor control strategy with a taste and odor monitoring program.

Chapter 9. Laboratory Procedures

1. Safely operate laboratory equipment.
2. Collect representative samples and also preserve and transport the samples.
3. Prepare samples for analysis.
4. Describe lab test limitations, recognize precautions for those tests, and record lab test results.
5. Perform the following field or laboratory tests—alkalinity, chlorine residual, chlorine demand, coliform, hardness, jar test, pH, temperature, and turbidity.

Appendix:

- Answer Key
- Appendix A, Math
- Glossary
- Index

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TIME ASSIGNMENT

Text Pages: The course uses the training manual *Water Treatment Plant Operation, Volume 1* (792 pages). The average word count on a page from the training manual is 515 words. Some pages contain tables, graphs, or illustrations to enhance the presentation of information. It is assumed that readers spend equal time studying tables, graphs, and illustrations as they would spend reading the equivalent amount of text. Therefore, each page is assumed to contain the equivalent of 515 words. Given that this training manual introduces many new concepts for a students to learn, a believable reading speed is 130 words per minute. Therefore, each page is projected to require 4 minutes of student time for each reading.

Math problems: The course contains 236 wastewater treatment math problems (Examples). Projected average time to solve each math problem is three minutes.

Questions: The course contains 525 assessment questions (Check Your Understanding) integrated into the reading. Each question requires a written response consisting one or more sentences. Projected average review question time is two minutes per question.

Review questions: The course contains 265 chapter review questions (Chapter Review). Projected average response time is two minutes per question.

Objective test questions: The course contains 450 objective test questions. Projected average response time is two minutes per question.

Component	Minutes per Component Unit	Number of Component Units	Time to Complete Units
Text pages	4	792	3,168
Math problems	3	236	708
Questions	2	525	1,050
Review questions	2	265	530
Objective test questions	2	450	900
Total (minutes)			**6,356**
Total (hours)			**106**

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