Operation of Wastewater Treatment Plants, Volume 1
C—Disinfection, Laboratory Procedures, and Math
Office of Water Programs
California State University, Sacramento
(4.0 Continuing Education Units)

COURSE DESCRIPTION

This course trains operators in the practical aspects of operating and maintaining disinfection processes, the performance of basic laboratory procedures, and practical mathematical concepts and applications. This course uses the following content from *Operation of Wastewater Treatment Plants*, Volume 1: Chapter 7, "Disinfection"; Chapter 9, "Laboratory Procedures"; and Appendix A, "Introduction to Basic Math for Operators." The information in this course will provide operators with an understanding of basic concepts in disinfection and laboratory procedures, an ability to analyze and solve problems when they occur on the job, and proficiency with mathematical calculations and formulas operators use on the job every day. The procedures and concepts discussed in this course can be adapted to fit the needs of different plants.

COURSE OUTLINE

The course uses selected chapters and Appendix A from the training manual, *Operation of Wastewater Treatment Plants,* Volume 1.

Chapter 7, Disinfection

Learning Objectives

1. Explain the disinfection process using chlorine, hypochlorite, ultraviolet (UV) radiation, and ozone.
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 safety programs for using, handling, and storing disinfectants.

The main purpose of this chapter is to train operators in the basic operation and maintenance of disinfection processes at wastewater treatment plants.

Chapter 9, Laboratory Procedures

Learning Objectives

1. Safely operate laboratory equipment.
2. Collect representative samples and 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. Understand principles that apply to field or laboratory tests for solids, gases, and chemical and biological parameters, as well as tests for process control and sludge.

The main purpose of this chapter is to train operators in the basic use of common laboratory equipment, procedures, and test methods used at wastewater treatment plants.

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Appendix A, Introduction to Basic Math for Operators

Learning Objectives

1. Perform basic math operations, such as addition, subtraction, multiplication, and division.
2. Understand units of measurement.
3. Calculate perimeters, circumferences, areas, and volumes of basic geometric shapes.
4. Analyze and solve math problems.
5. Solve problems related to basic physical concepts, such as flow rate, velocity, pressure, and power.
6. Solve unit conversion problems, including metric units.
7. Solve problems related to pumps.
8. Collect and analyze data, including:
    a. Recognize the presence of variation in data.
    b. Read manometers, gauges, and charts.
    c. Analyze and present data using charts, graphs, tables, and numbers.
    d. Calculate arithmetic mean, range, median, mode, geometric mean, moving average, variance, and standard deviation.
    e. Apply prediction equations, trends, and correlations to the analysis of data.

The main purpose of this appendix is to teach operators common mathematical concepts and practices used in the operation and maintenance of wastewater treatment plants.

TIME ASSIGNMENT

Text pages: The content from the training manual used in this course, *Operation of Wastewater Treatment Plants*, Volume 1, includes 390 pages. The average word count on a page from the training manual is 526 words. The training manual used for this course contains text, tables, graphs, illustrations, math example problems, section questions, and chapter review questions to enhance the presentation of information and the student learning experience. The course is designed for students to spend the same amount of time reading the tables, graphs, and illustrations as they spend reading the equivalent amount of related chapter text. Therefore, each page is assumed to contain the equivalent of 526 words. The average reading speed is 130 words per minute; therefore, each page is projected to require four minutes of student time for each reading.

Math example problems: The course contains 127 math example problems. The projected average time to solve each math problem is 3 minutes.

Section questions: The course contains 107 section questions, located in the "Check Your Understanding" sections integrated throughout the chapter text. These questions enable students to self-assess their understanding of a section's material before proceeding to the next section. The projected average response time is 2 minutes per question.

Chapter review questions: The course contains 80 review questions, located in the "Chapter Review" at the end of each chapter. Question types include fill-in, multiple choice, and matching. The projected average response time is 2 minutes per question.

Objective test questions: The course contains 135 test questions. There is 1 objective test per chapter. The projected average response time is 2 minutes per question.

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Course component	Number of component units		Minutes required to complete component unit		Total time assignment for component
Text pages	390	×	4	=	1,560
Math example problems	127	×	3	=	381
Section questions	107	×	2	=	214
Chapter review questions	80	×	2	=	160
Objective test questions	135	×	2	=	270
					2,585 minutes
					43.1 or 43 hours

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