

Industrial Waste Treatment, Volume 2
B—Activated Sludge Processes and Nutrient Removal
California State University, Sacramento
(3.7 Continuing Education Units)

COURSE DESCRIPTION

This course is designed to train operators in the practical aspects of operating and maintaining industrial wastewater treatment facilities emphasizing safe practices and procedures. Information is presented on activated sludge microbiology, aeration, secondary clarification, process configurations and controls, abnormal operation and troubleshooting, system startup and shutdown, and uses in industrial wastewater treatment, as well as biological and chemical nitrogen and phosphorus removal and enhanced nutrient removal processes.

COURSE OUTLINE

The course trains industrial waste treatment operators to safely and effectively operate and maintain activated sludge processes and nutrient removal systems.

Chapter 3, Activated Sludge Processes

Learning Objectives

1. Understand the biological and mechanical processes that perform the activated sludge process, including aeration, clarification, flows and loadings, and rates.
2. Inspect samples of activated sludge to observe the microbial population within the mixed liquor and determine the health of the system.
3. Operate activated sludge processes, including determining process loadings and applying operating parameters, ranges, and guidelines.
4. Identify factors that cause abnormal operation in the activated sludge process and take corrective action.
5. Safely operate, inspect, start up, and shut down activated sludge processes and unit equipment.

The main purpose of this chapter is to train operators in the basic operation and maintenance of activated sludge processes used at industrial wastewater treatment facilities, including aeration, secondary clarification, and process control.

Chapter 4, Nutrient Removal

Learning Objectives

1. Explain nitrogen and phosphorus removal systems, including nitrification, denitrification, luxury uptake, lime precipitation, and enhanced biological treatment.
2. Describe the safety, sampling procedures, and process control strategies associated with nitrogen and phosphorus removal systems.
3. Outline abnormal operating conditions, their causes, and corrective actions.

The main purpose of this chapter is to train operators in the basic operation and maintenance of nitrogen and phosphorus nutrient removal processes at industrial wastewater treatment facilities.

TIME ASSIGNMENT

Text pages: The content from the training manual used in this course, *Industrial Waste Treatment*, Volume 2, includes 340 pages. The average word count on a page from the training manual is 525 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 525 words. The average reading speed is 130 words per minute; therefore, each page is projected to require 4 minutes of student time for each reading.

Math example problems: The course contains 17 math example problems. The projected average time to solve each math problem is 3 minutes.

Section questions: The course contains 225 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 90 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 85 test questions. There is 1 objective test per chapter. The projected average response time is 2 minutes per question.

Course component	Number of component units	Minutes required to complete component unit	Total time assignment for component
Text pages	340 ×	4 =	1,360
Math example problems	176 ×	3 =	51
Section questions	225 ×	2 =	450
Chapter review questions	90 ×	2 =	180
Objective test questions	85 ×	2 =	170
			2,211 minutes
			36.9 or 37 hours