

Treatment of Metal Wastestreams
California State University, Sacramento
(2.6 Continuing Education Units)

COURSE DESCRIPTION

This course is designed to train operators in the practical aspects of operating and maintaining treatment plants that receive wastewater from electroplating, metal finishing, and printed circuit board manufacturing facilities. Information is presented on the need for treatment of metal wastestreams, sources of wastewater, workplace safety, and treatment strategies. Operators learn to operate and maintain the equipment and processes used to treat metal wastestreams and how to treat and dispose of sludges produced by treatment processes. This course focuses on operation, maintenance, and troubleshooting procedures, emphasizing safety. Math example problems guide operators through concepts and calculations needed to evaluate and adjust system performance.

COURSE OUTLINE

This course is designed to train operators to safely and effectively operate and maintain wastewater treatment facilities for electroplating, metal finishing, and printed circuit board manufacturing.

Chapter 1, Water Quality and Employee Safety

Learning Objectives

1. Explain metal wastestreams treatment requirements.
2. Identify the sources of metal wastestreams.
3. Identify and correct safety hazards in the workplace, including chemical hazards.

The main purpose of this chapter is to give an overview of metal wastestreams, their treatment requirements, and safety in metal wastestream treatment facilities.

Chapter 2, Methods of Treatment

Learning Objectives

1. Describe treatment methods used to treat metal wastes, including neutralization, metal precipitation, complexed metals removal, hexavalent chromium reduction, and destruction of cyanide by oxidation.
2. Explain batch and continuous treatment processes and describe the conditions in which each type of process is used.
3. Collect, treat, and dispose of sludge generated by these treatment processes.

The main purpose of this chapter is to train operators in the treatment methods used in metal wastestream treatment processes and the handling of sludge generated by these processes.

Chapter 3, Operation and Maintenance

Learning Objectives

1. Perform startup, shutdown, operation, and maintenance duties safely at metal wastestream treatment facilities.
2. Troubleshoot and correct problems at metal wastestream treatment facilities, including recycling off-spec wastewater.

3. Explain the use of and control of oxidation-reduction potential to treat metal wastestreams.
4. Describe the purpose of analytical laboratory support for treatment facilities.

The main purpose of this chapter is to train operators in the basic operation and maintenance of metal wastestream treatment processes and the application of laboratory results to control these processes.

TIME ASSIGNMENT

Text pages: The content from the training manual used in this course, *Treatment of Metal Wastestreams*, includes 210 pages. The average word count on a page from the training manual is 508 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 508 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 62 math example problems. The projected average time to solve each math problem is three minutes.

Section questions: The course contains 110 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 85 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 80 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	210 ×	4 =	840
Math example problems	62 ×	3 =	186
Section questions	110 ×	2 =	220
Chapter review questions	85 ×	2 =	170
Objective test questions	80 ×	2 =	160
			1,576 minutes
			26.3 or 26 hours