Treatment of Metal Wastestreams
Office of Water Programs
California State University, Sacramento
(4.5 Continuing Education Units)

COURSE DESCRIPTION

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

SCOPE

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, safety data sheets (SDSs), and the globally harmonized system of classification and labeling of chemicals (GHS). 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 the treatment processes. This course focuses on actual operation, maintenance, and troubleshooting procedures, with particular emphasis on safety. Operators also learn to solve arithmetic problems needed to operate treatment processes for metal wastestreams.

COURSE OUTLINE

The course uses *Treatment of Metal Wastestreams* training manual.

Chapter 1, Need for Treatment and Employee Safety

Following completion of Chapter 1, students should be able to:

1. Explain the need to treat metal wastestreams.
2. Identify the sources of metal wastestreams.
3. Obtain information on how to safely store and handle chemicals from a safety data sheet (SDS).
4. Determine what information employers must provide to operators regarding the handling of and exposure to hazardous materials in the workplace (worker Right-To-Know laws).

Chapter 2, Methods of Treatment

Following completion of Chapter 2, students should be able to:

1. Describe each of the methods used to treat metal wastes and how each method treats the wastestream.

2. Identify 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.
4. Operate and maintain treatment facilities for neutralization, metal precipitation, complexed metals removal, hexavalent chromium reduction, and destruction of cyanide by oxidation.

Chapter 3, Operation and Maintenance (O&M)

Following completion of Chapter 3, students should be able to:

1. Perform operation and maintenance duties safely at metal wastestream treatment facilities.
2. Troubleshoot and resolve issues at metal wastestream treatment facilities.
3. Explain how oxidation-reduction potential is used and controlled to treat metal wastestreams.
4. Describe the purpose of analytical laboratory support for treatment facilities.

TIME ASSIGNMENT

Text Pages: The course uses the training manual *Treatment of Metal Wastestreams* (146 pages). The average word count on a page from the training manual is 950 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 950 words. Accepted average adult reading speed is 200 – 250 words per minute. Therefore, each page is projected to require four minutes of student time for each reading.

Math problems: The course contains 48 wastewater treatment math problems. Projected average time to solve each math problem is three minutes.

Questions: The course contains 114 assessment questions 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.

Discussion questions: The course contains 21 discussion questions. Each discussion question requires a written response consisting one or more sentences. Projected average discussion question time is two minutes per question.

Review questions: The course contains 68 comprehensive review questions. Projected average response time is one minute per question.

Objective test questions: The course contains 139 objective test questions. Projected average response time is one minute per question.

Component	Minutes per Component Unit	Number of Component Units	Time to Complete Units
Text pages	4	146	584
Math problems	3	48	144
Questions	2	114	228
Discussion questions	2	21	42
Review questions	1	34	68
Objective test questions	1	139	139
Total (minutes)			**1,205**
Total (hours)			**20**