

Agenda: Wastewater Treatment Fundamentals I: Liquid Treatment

In Partnership with Water Environment Federation



This online eLearning course is being offered in partnership with Water Environment Federation (WEF).

Summary - Wastewater Treatment Fundamentals I: Liquid Treatment covers all aspects of liquid treatment processes and helps operators prepare for the first three levels of certification examinations. In addition to learning the basics of liquid treatment, operators will gain a thorough understanding of critical aspects of biological treatment, nutrient removal, and disinfection.

Estimate to Complete - 60 hours

Course Orientation (not included in est. 60 hours) - This preliminary section orients the student to the course content and mechanics.

Chapter 1: Introduction to Wastewater Treatment - This chapter discusses the need for wastewater treatment, presents a brief overview of some of the pollutants in wastewater, reviews the various federal laws and regulations applicable to the permitting of water resource recovery facilities (WRRFs), describes the typical unit processes used to provide safe and acceptable treatment of wastewater, and discusses treatment and disposal alternatives for the solids removed from wastewater.

Chapter 2: Wastewater Characteristics - Effective operation and control of a water resource recovery facility (WRRF) requires that the operator possess a thorough knowledge of the composition of the influent, effluent, and internal process streams. To obtain that knowledge, the operator determines the characteristics of the raw wastewater and streams by collecting and analyzing representative samples throughout the facility. This chapter provides operators with information on wastewater characterization flow monitoring, and sampling necessary to operate the facility effectively.

Chapter 3: Preliminary Treatment of Wastewater - This chapter presents descriptions of, and operational considerations for, preliminary treatment processes. The purpose of preliminary treatment is to remove, reduce, or modify wastewater constituents in the raw

influent that can cause operational problems with downstream processes or increase maintenance of downstream equipment.

Chapter 4: Primary Treatment of Wastewater - In this chapter, we turn our attention to primary treatment of wastewater, which involves using gravity and floatation to separate and remove readily settleable suspended solids (sludge) and readily floatable material (scum). Velocity of the wastewater is slowed, and settleable solids sink to the bottom of the tank. Floatable materials rise to the top of the tank, where they can be skimmed off and removed.

Chapter 5: Fundamentals of Biological Treatment - Biological treatment depends on a healthy community of bacteria and other microorganisms to produce a final, treated effluent that is clean and clear with very little biochemical oxygen demand and total suspended solids remaining. This chapter describes some of the different types of microorganisms and environmental conditions present in different types of biological secondary treatment processes.

Chapter 6: Wastewater Treatment Ponds - Wastewater treatment ponds (also called lagoons) are commonly used to treat municipal wastewater from small or rural communities with populations of fewer than 20,000 residents; however, they are capable of treating a variety of wastewaters from domestic wastewater to complex industrial wastes. They can operate in various climatic conditions, from the tropics to the arctic. Ponds may be combined with other treatment processes, or operate as standalone systems. In this chapter, we will explore the various types and implementations of treatment ponds.

Chapter 7: Fixed Film Treatment - Trickling filters and rotating biological contactors (RBCs) are fixed-film processes, which are used at many water resource recovery facilities (WRRFs). Fixed-film biological treatment processes remove dissolved organics and finely divided organic solids from wastewater. Removal occurs primarily by converting soluble and colloidal material into a biological film. This biological film, or biofilm, is attached to solid surfaces of support media. Fixed-film processes may also remove ammonia, nitrite, and nitrate.

Chapter 8: Activated Sludge - The activated sludge process is the most widely used biological treatment process for reducing the concentration of organic pollutants in wastewater. Well-established design and operational standards based on empirical data and scientific basis have evolved over the years. As a result, our understanding of the process has advanced from a system originally designed simply for removal of solids and organic material to one that now removes nutrients such as nitrogen and phosphorus. New process configurations and technologies continue to evolve.

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Chapter 9: Nutrient Removal - Fundamental concepts in biological treatment were discussed in Chapter 5, including an introduction to two groups of specialized microorganisms: nitrifying bacteria and phosphate accumulating organisms (PAOs). This chapter goes into more detail and discusses the wastewater characteristics and process variables that impact these microorganisms and that affect the ability of water resource recovery facilities (WRRFs) to remove ammonia, nitrite, nitrate, and phosphorus. Chemical phosphorus removal is also included in this chapter.

Chapter 10: Disinfection - Waterborne diseases arise from the contamination of water by any dozens of potential pathogens including viruses, bacteria, and protozoa. Disinfection inactivates microorganisms or reduces their numbers to safe levels where infection becomes unlikely. This chapter will describe the most commonly used disinfection practices including gaseous chlorine (Cl₂), sodium hypochlorite (NaOCl), calcium hypochlorite [Ca(ClO)₂], and UV irradiation.

Final Assessment - Students need to answer 70 out of 100 questions correct to pass the final assessment and receive credit for the Wastewater Treatment Fundamentals I: Liquid Treatment course.

WWTF I: End of Course Survey (not included in est. 60 hours) - After passing the final assessment, students are directed to an end of course survey to evaluate the learning experience and provide license information to ensure the information in the LMS is correct.

Course Schedule: Wastewater Treatment Fundamentals I: Liquid Treatment

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Estimate to Complete - 60 hours

Module Title	Average Time to Complete
Course Orientation (not included in est. 60 hours)	Not Applicable
Chapter 1: Introduction to Wastewater Treatment	3 hours
Chapter 2: Wastewater Characteristics	3 hours
Chapter 3: Preliminary Treatment of Wastewater	5 hours
Chapter 4: Primary Treatment of Wastewater	6 hours
Chapter 5: Fundamentals of Biological Treatment	4 hours
Chapter 6: Wastewater Treatment Ponds	4 hours
Chapter 7: Fixed Film Treatment	5 hours
Chapter 8: Activated Sludge	12 hours
Chapter 9: Nutrient Removal	8 hours
Chapter 10: Disinfection	8 hours
Final Assessment	4 hours
WWTF I: End of Course Survey (not included in est. 60 hours)	Not applicable