Constructed Wetlands - Free Water Surface Wetlands (RV-4932)

Hours: 3

Course Description

Constructed wetlands can be used as artificial wastewater treatment systems. There are many design factors which affect the effluent quality from a free water surface constructed wetland. This 3-hour online course covers the consideration of some of these factors that can significantly reduce the effluent variation. It also provides a brief summary of expected wetland treatment performance, describes issues that are important in the design and layout of a free water surface wetland, and includes several design examples. Construction issues unique to constructed wetlands are also discussed

Course Objectives

Upon completion of the course, you will:

- Understand the performance expectations of a free water surface wetland, including expectations for BOD, TSS, nitrogen, phosphorus, fecal coliforms and metals
- Understand the hydrology of a free water surface wetland, including wastewater inflow and outflow, runoff, evapotranspiration and infiltration losses
- Understand the basics of hydraulics for a free water surface wetland
- Understand the rationale for wetland system design and sizing
- Understand the factors that influence wetland system design
- Understand the components of a free water surface wetland system

1. **Example of Program Completion Form or Document**

   Sample certificate attached

2. **Course Outline**

   Introduction – 10 minutes

   Wetland Hydraulics – 60 minutes

   - Performance Expectations
   - Range of Operating Conditions and Performance
   - BOD Performance
   - TSS Performance
   - Nitrogen Performance
     - TKN Performance
     - Denitrification
     - Ammonia Nitrogen Performance
     - Other Nitrogen Performance
   - Total Phosphorus Performance
   - Fecal Coliform Performance
   - Metals & Other Particulate-Oriented Pollutants
   - Stochastic Variability
   - Wetland Hydrology
   - Wetland Water Balance
   - Wastewater Inflow
   - Precipitation, Snowmelt, and Catchment Runoff
   - Wastewater Outflow

- Evapotranspiration
- Infiltration and Berm Losses
- Wetland Volume
- Wetland Volume
- Wetland Hydraulics Terminology and Definitions
    - Water Depth
    - Volume
    - Wetland Porosity or Void Fraction
    - Average Wastewater Flow
    - Hydraulic Retention Time
    - Hydraulic Loading Rate
- Water Conveyance

Wetland System Design – 45 minutes

- Existing Models
- Areal Loading Rates
- Design
    - Design Sizing and Performance Mechanisms
    - Total Suspended Solids Removal Design Considerations
    - Design Examples

Design Issues – 60 minutes

- Design Issues & Construction / Civil Engineering Issues
- Wetland Layout
    - Site Topography
    - Aspect (length to width) Ratio
    - Wetland configuration
    - Multiple cells
    - Open water/Vegetation ratio
- Internal Wetland Components
    - Open water/Vegetation ratio
    - Inlet Settling Zone
    - Inlet/Outlet Structures
    - Baffles
    - Recirculation
    - Flow Measuring Devices
- Pretreatment Requirements
- Construction/Civil Engineering Issues
    - Site Topography and Soils
    - Impermeable Liner Materials
    - Soil Substrates for Plants
    - Internal Drainage and Flexible Piping

Conclusion – 5 minutes

3. List of Instructional Materials Used in Course

The course is reviewed online and is available to anyone who purchases it 24/7 as long as there is computer and internet access.

All material necessary to complete the course is included by viewing online. Students are not directed to additional material as a requirement for course completion, only as added information for personal interest.

4. **Name, Address, and Background of the Instructor**
   Mark Peterson
   Resume attached