University Curriculum Development for Decentralized Wastewater Treatment

Spray Dispersal

Suggested Course Materials

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Citation of Materials

The educational materials included in this module should be cited as follows:

Lesikar, B.J., V. Weynand, and M. Lilie 2005. Spray Dispersal: Operation and Maintenance Text. *in* (M.A. Gross and N.E. Deal, eds.) University Curriculum Development for Decentralized Wastewater Management. National Decentralized Water Resources Capacity Development Project. University of Arkansas, Fayetteville, AR.

Lesikar, B.J., V. Weynand, and M. Lilie 2005. Spray Dispersal: Introduction - PowerPoint Presentation. *in* (M.A. Gross and N.E. Deal, eds.) University Curriculum Development for Decentralized Wastewater Management. National Decentralized Water Resources Capacity Development Project. University of Arkansas, Fayetteville, AR.

Lesikar, B.J., V. Weynand, and M. Lilie 2005. Spray Dispersal: System Components - PowerPoint Presentation. *in* (M.A. Gross and N.E. Deal, eds.) University Curriculum Development for Decentralized Wastewater Management. National Decentralized Water Resources Capacity Development Project. University of Arkansas, Fayetteville, AR.

Lesikar, B.J., V. Weynand, and M. Lilie 2005. Spray Dispersal: Site Considerations - PowerPoint Presentation. *in* (M.A. Gross and N.E. Deal, eds.) University Curriculum Development for Decentralized Wastewater Management. National Decentralized Water Resources Capacity Development Project. University of Arkansas, Fayetteville, AR.

Lesikar, B.J., V. Weynand, and M. Lilie 2005. Spray Dispersal: Design Considerations - PowerPoint Presentation. *in* (M.A. Gross and N.E. Deal, eds.) University Curriculum Development for Decentralized Wastewater Management. National Decentralized Water Resources Capacity Development Project. University of Arkansas, Fayetteville, AR.

Lesikar, B.J., V. Weynand, and M. Lilie 2005. Spray Dispersal: Installation Considerations - PowerPoint Presentation. *in* (M.A. Gross and N.E. Deal, eds.) University Curriculum Development for Decentralized Wastewater Management. National Decentralized Water Resources Capacity Development Project. University of Arkansas, Fayetteville, AR.

Lesikar, B.J., V. Weynand, and M. Lilie 2005. Spray Dispersal: Operation and Maintenance Considerations - PowerPoint Presentation. *in* (M.A. Gross and N.E. Deal, eds.) University Curriculum Development for Decentralized Wastewater Management. National Decentralized Water Resources Capacity Development Project. University of Arkansas, Fayetteville, AR.

Spray Dispersal
Suggested Course Materials

Table of Contents

Spray Dispersal
Overview

This module provides students a basic understanding of how spray distribution systems can effectively disperse wastewater into soils for final treatment and reuse of the effluent. Upon completing this module, students will have a fundamental understanding of the components of a spray dispersal system, a knowledge of how the components can be connected together to form a system, and an understanding of how the components will interact together to form a functional wastewater treatment and dispersal system.

Topics included in this course module include why use a spray dispersal system, water quality requirements for using this dispersal technology, function of the spray system components, key spray system design considerations, spray system installation considerations, start-up considerations, operational requirements, and maintenance issues.

These materials should be used when discussing final treatment and dispersal systems. These materials assume the student has an understanding of pressurized distribution systems, pumps, controls, pretreatment options, and disinfection.

Spray Dispersal
Agenda

The spray distribution materials cover the broad spectrum of topics ranging from introduction of the topic to details on components, design, and operation and maintenance. It is anticipated that each instructor will customize the spray distribution materials to suit their particular situation, no single agenda could address the myriad of possible permutations. Should an instructor choose to cover all the topics included in this module, the following agenda is suggested. Each class period is assumed to be 50 minutes.

Class 1: Introduction to the concept of Spray Distribution and System components.

Class 2: Spray Distribution System Design and O&M

Spray Dispersal

Outline

I. Introduction
- A. Water reuse
- B. Evapotranspiration
- C. Color Coding

II. Water Quality Requirements
- A. Secondary quality effluent
- B. Disinfection

III. System Components
- A. Pumps
- B. Pump tanks
- C. Supply lines
  1. Manifolds
  2. Laterals
  3. Risers
  4. Air relief
  5. Water hammer
- D. Heads
  1. Flow rate
  2. Distance of throw
  3. Types
     a. Impact
     b. Rotors
     c. Spray
- E. Disinfection
- F. Controls

IV. Design considerations
- A. Site and soil considerations
  1. Soils
  2. Grade
  3. Climate
- B. Site preparation
  1. Site leveling and drainage
  2. Surface water runoff
  3. Surface water runon
- C. Irrigation versus dispersal
- D. Effluent application rates
  1. Daily loading
  2. Plant water requirements

3. Infiltration rates for soils

E. Nutrient loading
    1. Nitrogen
    2. Phosphorous

F. Water storage requirements

G. Water distribution
    1. Uniformity
    2. Application rate
    3. Elevation of head
    4. Matching distribution method to vegetation management

H. Pump selection
    1. Total flow
    2. Total dynamic head

I. Drift minimization

J. Setback distances

K. Component matching

V. Installation considerations

VI. Operation considerations
    A. Timing of application
    B. Vegetation management
    C. Record keeping

VII. Maintenance considerations

Spray Dispersal
Goals

The goal for this module is to provide students a basic understanding of how spray dispersal systems can effectively disperse wastewater into soils for final treatment and reuse of the effluent.

Spray Dispersal
Learning Objectives

Upon completing this module, students will have:

a. A fundamental understanding of the components of a spray dispersal system,
b. A knowledge of how the components can be connected together to form a system
c. An understanding of how the components will interact together to form a functional wastewater treatment and dispersal system.

Spray Dispersal
Prerequisites

It is anticipated that the students who takes this class will have a basic understanding of wastewater treatment including terminology associated with discussions of wastewater systems and wastewater quality parameters. It is anticipated that the materials in this module will be used in conjunction with materials in other modules. Specifically, the Hydraulics Module describing pressure distribution systems and the Instrumentation and Controls Module dealing with pump system controls.

The typical student utilizing these materials will be a junior- or senior-level undergraduate in engineering, soil science or pubic health related field who has an interest in decentralized wastewater management.

Spray Disperal
Evaluation Form

Reviewer: _____

We are requesting your assistance in reviewing the modules developed through the On-Site Consortium curriculum project. Please complete the following form while reviewing the materials

With a rating scale of 1 (Disagree) to 5 (Agree), please respond to the following questions

Review of printed materials:

	Disagree Agree
The text completely covers the topic area.	1 2 3 4 5
The visuals completely cover the topic area.	1 2 3 4 5
The discussion notes completely cover the topic area.	1 2 3 4 5

Review of learning objectives:

I gained a better understanding of how spray systems operate.	1 2 3 4 5
I gained a better understanding of how to assemble a spray system.	1 2 3 4 5
I gained a better understanding of the components function together.	1 2 3 4 5

What specific recommendations would you provide for the text. _____
_____
_____
_____

What specific recommendations would you provide for the visuals._____
_____
_____
_____

What specific recommendations would you provide for the notes. _____
_____
_____
_____

Please give specific positive comments on the topic/module. _____
_____
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_____