

Subsurface Drip 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. and J.C. Converse 2005. Subsurface Drip Dispersal 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. and J.C. Converse 2005. Subsurface Drip 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. and J.C. Converse 2005. Subsurface Drip Dispersal: Components and Layout - 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. and J.C. Converse 2005. Subsurface Drip Dispersal: Drip Emitters and the Soil - 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. and J.C. Converse 2005. Subsurface Drip Dispersal: Drip System Design - 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. and J.C. Converse 2005. Subsurface Drip Dispersal: System Installation - 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. and J.C. Converse 2005. Subsurface Drip Dispersal: Startup 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. and J.C. Converse 2005. Subsurface Drip Dispersal: Operation and Maintenance - 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.

Subsurface Drip Dispersal Suggested Course Materials

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Subsurface Drip Dispersal Agenda

The subsurface Drip Dispersal materials cover the broad spectrum of topics ranging from introduction of the topic to details on design, installation, and operation and maintenance. It is anticipated that each instructor will customize the subsurface Drip Dispersal 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.

Subsurface Drip Dispersal Overview

This module provides students a basic understanding of how drip dispersal 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 drip dispersal system, 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 drip dispersal system, how the system interacts with the soil, function of the drip system components, key drip system design considerations, drip 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 soils, pressurized distribution systems, and pretreatment options.

Subsurface Drip Dispersal Outline

I. Introduction

- A. Decentralized wastewater management
- B. Advantages of drip
 - 1. Even distribution
 - 2. Water recycling
 - 3. Difficult sites
 - a. Small lots
 - b. Vertical separation issues:
 - (1) Groundwater
 - (2) Restrictive horizons
 - c. Steep slopes
 - d. Shallow soils
 - e. Clayey soils
- C. Potential problems
 - 1. Clogging of emitters
 - a. Self-cleaning emitters
 - b. Advanced pretreatment
 - 2. Water redistribution

II. System Components

- A. Pretreatment components
- B. Pump tank
 - 1. Function
 - a. Flow equalization
 - b. Emergency storage
 - 2. Volume considerations
 - a. Static water volume
 - (1) Submersible pump
 - (2) Turbine pump
 - (3) Suction pump
 - b. Dose volume
 - c. Emergency storage
 - 3. Associated Pump Tank components
 - a. Pump
 - b. Pressure regulator
- C. Dose controller
 - 1. On-demand (float controlled)
 - 2. Timer-controlled (electrical panel)
- D. Filtration
 - 1. Types of filters
 - a. Disk
 - b. Spin/Screen

2. Types of systems based upon pretreatment
 - a. Mechanically filtered septic tank effluent
 - b. Aerobically treated effluent system

E. Drip dispersal unit

1. Components
 - a. Pressure regulation
 - b. Supply and return line
 - c. Air relief valve/vacuum breaker
 - d. Manifold
 - e. Drip line
2. Terminology
 - a. Zone
 - b. Run
 - c. Lateral
3. Types of Emitters
 - a. Pressure-compensating
 - b. Turbulent or non-pressure compensating
4. Connection of drip lines to manifold
5. Special design considerations
 - a. Drainage during depressurization
 - b. Saturated soils

III. Drip emitters and the soil

- A. Loading rates
 1. Hydraulic
 2. Organic
- B. Water Movement in Soil
 1. Saturated
 2. Unsaturated
 3. Preferential
- C. Water movement in a Drip field
 1. Saturated flow around the emitter
 2. Unsaturated flow into the soil treatment area
 3. Saturated flow away from the treatment area

IV. System Design

- A. Effect of effluent quality on soil loading rate
- B. Types of loading rates
 1. Areal loading rate
 2. Infiltrative surface rate
 3. Linear loading rate
 4. Landscape linear loading rate
 5. Instantaneous loading rate
- C. Additional considerations
 1. Vertical separation

2. Climate
3. Application Schedule
4. System configuration

V. Installation considerations

- A. Site selection
- B. Tubing installation options
- C. Equal tubing length
- D. Specialized fittings
- E. Bedding
- F. Preassembly
- G. Proper handling of PVC
- H. Connection of drip lines
- I. Confirmation of elevation
- J. Air relief/vacuum breaker installation
- K. Freeze protection

VI. Start-up considerations

- A. Flush lines
- B. Check connections
- C. Verify operating pressure
- D. Record baseline flow rates and operating pressures
- E. Check dose volume and drainfield performance
- F. Check depressurized flow conditions
- G. Check air relief valves/vacuum breakers

VII. Operation and Maintenance

- A. Pretreatment System
- B. Pump Tank
- C. Pump Screens
- B. Sensors
- D. System Override Operation
- E. Operating pressure
- F. Visual inspection of drip field
- G. Air relief valves
- H. Water usage
- I. Field flow rate
- J. Field flushing
- K. Repairing a drip line
- L. Filters
- M. Monitors
- N. Pests
- O. Field control valves
- P. Lightning issues
- Q. Large system concerns

Subsurface Drip Dispersal Goals

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

Subsurface Drip Dispersal Learning Objectives

Upon completing this module, students will have:

- a. A fundamental understanding of the components of a drip 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.

Subsurface Drip Dispersal

Prerequisites

It is anticipated that the students who take 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 public health related field who has an interest in decentralized wastewater management.

Subsurface Drip Dispersal 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 drip systems function. | 1 | 2 | 3 | 4 | 5 |
| I gained a better understanding of how to assemble a drip system. | 1 | 2 | 3 | 4 | 5 |
| I gained a better understanding of how components of system interact. | 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.

Subsurface Drip Dispersal Problem Sets

Under development

Subsurface Drip Dispersal Problem Sets with Answers

Under development

