

# **University Curriculum Development for Decentralized Wastewater Management**

## **Media Filters**

### **Suggested Course Materials**

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# Media Filters

## Suggested Course Materials

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# **Media Filters**

## **Agenda**

The material in this module can be utilized to teach courses with a variety of agendas. It might be utilized as organized for a complete presentation or set of presentations completely covering the field of pack bed filters. Another approach might be to utilize portions of the materials to teach selected topics such as a topic on single path sand filters, a topic on re-circulating sand filters, a topic on specific manufactured media filters or a topic on maintenance and monitoring of pack bed filters.

# **Media Filters**

## **Overview**

The intent of the media filters module is to provide sufficient materials with adequate details so that someone who is familiar wastewater treatment, but possibly not familiar with Media Filters can pick up the materials and teach the full module, or portions thereof, as indicated in the above agenda description. Media Filters provide an effective, passive method of achieving a high level of secondary wastewater treatment with a low energy, simple system that requires little maintenance. Media Filters are likely to be used extensively for individual homes, small communities, sub-divisions and some commercial facilities in the future. Knowledge of media filters and their design will be important to engineers and public health officials in years to come.

# Media Filters

## Module Outline

- I. Introduction
- II. Purpose and Application
- III. Types of Media Filters
  - A. Sand/Gravel Filters
  - B. Peat Filters
  - C. Manufactured Media Filters
  - D. Other Fixed Film Processes
- IV. Theory of Operation
  - A. Nature of the Fixed Film
  - B. Media Characteristics
- V. Single-pass Systems
  - A. Gravity Fed Single-pass Sand Filters
    - 1. Free Access
    - 2. Buried Gravity Flow
  - B. Pressure Dosed Single Pass Sand Filters
    - 1. Location
    - 2. SPSF Media
    - 3. Loading Rate and Surface Area
  - C. Single-pass Peat Filters
- VI. Recirculating Systems
  - A. Recirculation Ratio (Rr)
  - B. Recirculating sand filters
  - C. Recirculating Gravel Filters
  - D. Recirculation tank
  - E. RSF media
  - F. Filter drain
  - G. Loading Rate and Surface area
  - H. Distribution System Design
  - I. Pumping Systems for RSFs
  - J. Large Recirculating Sand Filters
- VII. Textile Filters
- VIII. Open Cell Foam Filters
- IX. Controls
  - A. Level Sensors
  - B. Determining Timer Settings
- X. Pump Selection
- XI. System Monitoring
  - A. Monitoring Tubes
  - B. Remote Monitoring
  - C. Monitoring Routine
  - D. Monitoring User Inputs

- XII. Soil Dispersal of Media filter Effluent
- XIII. Example Designs
- XIV. References

# **Media Filters**

## **Goals**

The goal of the course is to provide information and background so that students come to understand how Media Filters operate and are designed.

# **Media Filters**

## **Learning Objectives**

In this course the students will learn what a media filter is, its physical characteristics and a little about the biological processes that go on within the filter. Students will become familiar with several different media that can be used in Media Filters and will understand why design criteria vary for the different types of media. They will learn the importance of applying small, frequent doses of wastewater and different methods for achieving wastewater distribution on a media filter. Students will learn the differences between single pass and recirculating systems and be able to design each. They will learn how to adjust controls for the pumps for both types of systems.

Upon completion of the course, the students will be able to design a generic media filter or choose a proprietary media filter for a specific application.

## **Media Filters**

### **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 including the Septic Tank Module, the Hydraulics Module describing pressure distribution systems and the Instrumentation and Controls Module dealing with pump system controls.

## **Media Filters Evaluation Form**

## **Media Filters**

### **Problems Sets**

Problem sets are still in preparation as of September 1, 2003

**Media Filters**  
**Problem Set Solutions**

In preparation

**Media Filters**  
**Additional Materials**

Additional materials that will be useful in teaching this course include materials from manufacturers of proprietary products, such as sand filter components, pumps and pump controls, pump vaults, sand filter kits, and modular pack bed filters. If the instructor has access to a training center, providing students with the opportunity to see sand filters in the field that have been developed for illustrative and demonstrational purposes at a training center can be very helpful for illustrating concepts. Also various proprietary pack bed filters may exist at training centers and can also be great assets for instruction. Additional materials that can be brought into the classroom would include short sections of distribution piping and orifice shields, examples of various media used in Media Filters, materials for running a jar test of sand to check for fines, and examples of pack bed filter effluents and septic tank effluent for comparatively purposes. There are a variety of on-line resources that can be helpful to the students, as well as to the instructor for up-to-date information. These include, but are not limited to:

- Orenco Systems Co. ([www.orenco.com](http://www.orenco.com))
- American Manufacturing Co. ([www.americanonsite.com](http://www.americanonsite.com))
- Waterloo BioFilter Co. ([www.waterloo-biofilter.com](http://www.waterloo-biofilter.com))
- Zabel Environmental Technologies, ([www.zabel.com](http://www.zabel.com))
- Borg Na Mona (peat filters) ([www.bnm-us.com](http://www.bnm-us.com))
- Premier Tech. (Peat filters) ([www.premiertech.com](http://www.premiertech.com))
- Eco Pure (Peat filters)
- Septisorb (Peat filters)
- Small Flows Clearing House ([www.nsfv.wvu.edu](http://www.nsfv.wvu.edu))

In addition to the above proprietary sources there are several manufactures of modular sand filters but their distribution is primarily local.