

ABE 5707C Agricultural Waste Management

Fall Semester, 2004

- I. Agricultural Waste Management, 3 credits.
- II. Course Description - Engineering analysis and design of systems for the collection, storage, treatment, transport, and utilization and disposal of livestock and other agricultural organic wastes and wastewaters. Field trips to operating systems and laboratory evaluation of materials and processes.
- III. Objectives:
 1. To familiarize students with the physical, chemical and biological properties of livestock wastes and their impact on the environment.
 2. To develop the students' abilities to analyze and design systems for the collection, handling, treatment and utilization of these wastes.
 3. To provide familiarization with operating waste management systems via field trips.
- IV. Format - Two lectures and one laboratory per week. Laboratories will be field trips to commercial livestock production, agricultural processing plants, or other waste treatment and handling facilities. Lecture will be conducted when a field trip has not been scheduled during the laboratory period.
- V. Instructor - Dr. Roger A. Nordstedt
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- VI. Textbooks -
 1. Agricultural Waste Management Field Handbook.
National Engineering Handbook, Part 651. U.S. Department of Agriculture, Soil Conservation Service, Washington, D.C.
<http://www.info.usda.gov/CED/Default.cfm?xSbj=51&xAud=24>
 2. Cornell Composting
http://compost.css.cornell.edu/Composting_homepage.html
- VII. References -
 1. ASAE. Standards 1999. American Society of Agricultural Engineers, St. Joseph, MI.
 2. ASAE. Transactions of the ASAE. American Society of Agricultural Engineers, St. Joseph, MI.
 3. ASAE. Journal of Applied Engineering in Agriculture. American Society of Agricultural Engineers, St. Joseph, MI.
- VIII. Grades - Grades will be based upon field trip reports and homework problems.

Lecture Topics

1. Introduction to course
2. Problems with livestock wastes and pollution potential
3. Characteristics of livestock wastes and quantities produced
4. Waste and wastewater analysis
5. Introduction to municipal sewage treatment
6. Components of livestock waste handling systems
7. Runoff control systems
8. Non-point pollution from livestock origins
9. Land application of wastes and effluents
 - a. Considerations
 - (1) heavy metals
 - (2) crop requirements
 - b. Methods
 - c. Calculations (solid, liquid, and dilute)
10. Value of nutrients in livestock wastes
11. Solids separation processes
12. Lagoon systems
 - a. Anaerobic
 - b. Aerobic
 - c. Mechanically aerated
13. Oxidation ditch systems
14. Liquid manure handling systems
15. Large scale "dry" or solid handling systems
16. Manure or slurry irrigation systems
17. Anaerobic digestion systems
18. Legal and regulatory aspects of livestock waste management
 - a. Permit requirements
 - b. Odor nuisance
 - c. Fly nuisance or health hazard
19. Composting
 - a. Principles of composting
 - b. Types of systems
 - c. Materials handling
 - d. Marketing
20. Management of dead animals
 - a. Rendering plants
 - b. Incinerators
 - c. Disposal pits

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Field Trip Report Format

The field trip report should be a summary of information gathered at the facility which was visited. It should include any facts and observations which you might need at a later date to do a design problem or to prepare a more elaborate or comprehensive report. It should be well-organized and neat (preferably typed or printed). It may also include some analysis of the facility, perhaps resulting from some routine calculations, or it could include suggestions for improvements in physical facilities or operational procedures.

A suggested outline might be as follows:

1. Title (name of facility, location, date of visit, your name, etc.) This need not be a separate page.
2. Description of the facility (general layout, operation, areas visited, names of people to contact, etc.) Hand-drawn sketches may be helpful.
3. Data summary (animal populations, processing or waste treatment system capacity, animal weights, age, water use, wastewater flow, equipment sizes, etc.)
4. Sketches or drawings (facility layout, flow diagrams, etc.), if not included in part 2.
5. General observations (good or poor management, suggestions for changes in practices, additional facilities or modifications needed, etc.) Be critical.