

WASTE

By Mr PH Lui



HKIQEP
香港環專會

Agenda

1. Syllabus
2. Suggested Reading Materials
3. Sample Questions

Syllabus

1. Waste Sources and Classification
2. MSW Composition and Properties
3. MSW Management
4. MSW Source Separation, Collection and Transportation
5. MSW Reduction and Recycling
6. MSW Treatment
7. MSW Disposal
8. Food Waste
9. Construction Waste
10. Hazardous Waste
11. Clinical Waste
12. Sludge
13. Livestock Waste
14. Dredged Mud and Excavated Material
15. Radioactive Waste
16. Contaminated Site Remediation
17. Facilities Siting and Development
18. Occupational Health and Safety

Syllabus

1. Waste Sources and Classification

- 1.1 Sources and Problems of Waste
- 1.2 Waste Classification
 - 1.2.1 Municipal Solid Waste (MSW)
 - 1.2.2 Overall Construction Waste
 - 1.2.3 Special Waste (*e.g., chemical waste, clinical waste, livestock waste, treatment plant residues, dredged mud and excavated material, radioactive waste*)

2. MSW Composition and Properties

- 2.1 Composition Analysis and Field Surveys
- 2.2 Analysis of Properties
 - 2.2.1 Physical properties
 - 2.2.2 Chemical properties
 - 2.2.3 Biological properties

3. MSW Management

- 3.1 Functional Elements of Waste Management System
- 3.2 Waste Management Hierarchy
- 3.3 Integrated Waste Management
- 3.4 Life Cycle Assessment
- 3.5 Economic Tools for Waste Management: back-end charges, front-end charges, deposit – refund system
- 3.6 Waste Management Law

Syllabus

4. MSW Source Separation, Collection and Transportation

- 4.1 Source Separation
- 4.2 Collection: stationary container system, hauled container system
- 4.3 Transportation
 - 4.3.1 Refuse collection vehicles
 - 4.3.2 Transfer station

5. MSW Reduction and Recycling

- 5.1 Chain and Levels of Recycling Operations
- 5.2 Types of Recyclables
- 5.3 Recyclables Segregation and Material Recovery Facility
- 5.4 Recycling Processes
- 5.5 Market and Outlet of Recyclables
- 5.6 Government Support to Recycling (*e.g., Recycling Fund, land and infrastructure support, statutory measure*)

6. MSW Treatment

- 6.1 Treatment Objectives
- 6.2 Mechanical Treatment: size reduction, sorting, separation, compaction
- 6.3 Thermal Process
 - 6.3.1 Incineration
 - 6.3.2 Other thermal process (*e.g., co-combustion, gasification, pyrolysis*)
- 6.4 Biological Treatment
 - 6.4.1 Composting
 - 6.4.2 Anaerobic digestion

7. MSW Disposal

- 7.1 Landfill Disposal: disposal operation, waste degradation process, environmental issues (*e.g. landfill gas, leachate*), design and operation considerations
- 7.2 Landfill Monitoring
- 7.3 Landfill Restoration and Aftercare

Syllabus

8. Food Waste

- 8.1 Sources
- 8.2 Characteristics and Disposal Problems
- 8.3 Food Waste Reduction
- 8.4 Collection, Recycling, Treatment and Disposal

9. Construction Waste

- 9.1 Sources
- 9.2 Composition and Characteristics
- 9.3 Storage, collection and transportation
- 9.4 Construction Waste Charging
- 9.5 Reuse, treatment and disposal: public fill reception facilities, sorting facilities, fill bank and recycling

10. Hazardous Waste

- 10.1 Sources: households, commerce, industry, shipping (MARPOL waste)
- 10.2 Classification and Characterisations: ignitability, corrosivity, reactivity, toxicity, carcinogenicity
- 10.3 Storage, Collection and Transportation
- 10.4 Treatment and Disposal: physical treatment, chemical treatment, oil/water separation, incineration, stabilization

11. Clinical Waste

- 11.1 Sources
- 11.2 Classification
- 11.3 Storage, Collection and Transportation
- 11.4 Treatment and Disposal

12. Sludge

- 12.1 Sources: water works, sewage treatment plants
- 12.2 Characteristics
- 12.3 Storage and Transportation
- 12.4 Treatment and Disposal

Syllabus

13. Livestock Waste

- 13.1 Source
- 13.2 Characteristics
- 13.3 Collection, Treatment and Disposal

14. Dredged Mud and Excavated Material

- 14.1 Source
- 14.2 Classification and Characterisation: uncontaminated and contaminated material
- 14.3 Collection, Treatment and Disposal
- 14.4 Management, Treatment and Disposal: beneficial reuse, open water disposal, confined disposal, treatment to reduce contaminant levels

15. Radioactive Waste

- 15.1 Characteristics
- 15.2 Source and Classification: very low level, low level, intermediate level, high level wastes
- 15.3 Collection, Transportation and Storage

16. Contaminated Site Remediation

- 16.1 Causes and Hazards of Land Contamination
- 16.2 Contaminant Fate and Transport
- 16.3 Site Characterization
- 16.4 Investigation Methodologies
- 16.5 Remediation Standard and Technologies: ex-situ treatment, in-situ treatment, containment

17. Facilities Siting and Development

- 17.1 Facility Siting : controversies, NIMBY attitude
- 17.2 Siting Considerations
- 17.3 Preferred Site Identification
- 17.4 Design, Build and Operate Contract

18. Occupational Health and Safety

- 18.1 Health and Safety Risks of Waste Management Activities
- 18.2 Means for Up-keeping Occupational Health and Safety: safety and health management system
- 18.3 Safety and Health Legislations

Suggested Reading Materials

- Thomas Christensen, "Solid Waste Technology and Management". John Wiley & Sons Ltd., 2011.
- George Tchobanoglous and Frank Kreith, "Handbook of Solid Waste Management", McGraw Hill Professional, 2002.
- John Pichtel, "Waste Management Practices: Municipal, Hazardous and Industrial", Taylor & Francis Group, 2nd ed. 2014.
- William A. Worrell and P Aarne Vesilind, "Solid Waste Engineering", Cengage Learning, 2nd ed. 2012
- Environmental Protection Department, "Monitoring of Solid Waste in Hong Kong: Waste Statistics for 2015", 2016
- Environmental Protection Department, "Environment Hong Kong 2015", 2016
- Environment Bureau, "Hong Kong Blueprint for Sustainable Use of Resources 2013 - 2022", 2013
- Environment Bureau, "A Food Waste and Yard Waste Plan for Hong Kong 2014 - 2022", 2014
- Website of Environmental Protection Department, HKSAR (e.g. waste section, guideline & references): www.epd.gov.hk
- Recommended Study Materials, Text Books & Resources of Qualified Environmental Professional (QEP) Certification, The Institute of Professional Environmental Practice