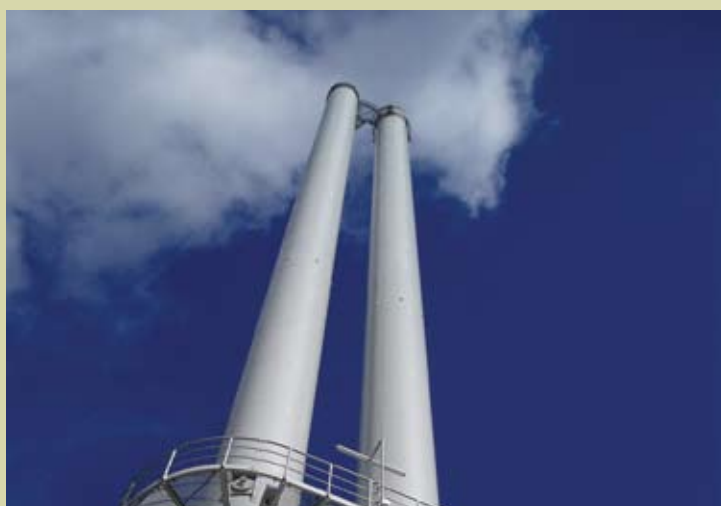


Level 3 Award in The Principles and Practices of Sustainable Waste Management



This document presents the structure of the Level 3 in Principles and Practices of Sustainable Waste Management.

Qualification number: 500/1691/X

The first section introduces the six units:

1. Principles of Sustainability and its impact on Waste Management
2. Waste Generation in the UK
3. Waste Management Policy and Legislation
4. Roles and Responsibilities of stakeholders involved in Waste Management
5. Technical Aspects of Waste Management
6. Health and Safety in the Waste Management Industry

Unit 1

Principles of Sustainability and its impact on Waste Management

No. of taught hours: 2 (guideline)

No. of student-centred learning hours: 10 (guideline)

Unit status: Mandatory

Unit Overview:

This unit has been designed as a stand alone unit on the principles of sustainability and its impact on waste management for the L3VRQ in Principles and Practices of Sustainable Waste Management.

Before studying the legislation and practicalities of waste management, it is important that the student understands the concept of sustainable development and its influence on the development of waste management. Unit 1 outlines the main international agreements behind the concept of sustainable development. Waste is introduced and defined and the impact that sustainability has on waste management and how waste management is changing to meet longer term needs is discussed.

The learning materials have been designed taking into account that some students will have no prior knowledge of the concept of sustainable development, whilst ensuring that the learning objectives conform to the level required at Level 3.

Lecture Structure:

	Lecture Title	Tuition	Private Study
U1 L1	Principles of Sustainability	2 hrs	10 hrs

On successful completion of the unit, students will be able to:

Learning Outcomes	<ul style="list-style-type: none">• Illustrate how waste management fits with sustainable development• Describe the waste hierarchy and what is meant by sustainable waste management (including any limitations in common definitions)• Identify where, within the waste management hierarchy, any particular technology sits
Teaching Strategies	<ul style="list-style-type: none">• Lectures – to provide basic introduction to the subject and present the key factual information• Group discussions – to explore the range of understanding of the term 'sustainability' and the implications associated with its achievement• Tutorials – to support the lectures and ensure full comprehension
Assessment Strategies	<ul style="list-style-type: none">• Written assignment• Assessed class debate• Tutor observation• Portfolio work

Unit 2

Waste Generation in the UK

No. of taught hours: 2 (guideline)

No. of student-centred learning hours: 10 (guideline)

Unit status: Mandatory

Unit Overview:

This unit has been designed as a stand alone unit on the different types of waste generated in the UK for the Level 3 in Principles and Practices of Sustainable Waste Management. The purpose of this unit is to provide the student with essential background knowledge on the different waste types produced, the effect of their characteristics on the treatment options available and the factors affecting waste generation.

Understanding the nature and quantity of waste produced in the UK enables the student to appreciate the backdrop to which legislation is introduced and the potential for different technologies to handle this waste. Unit 2 summarises the different waste types produced in the UK. The factors affecting the composition and amount of waste generated are explained and an historical perspective of waste generation is provided to demonstrate the link with socio-economic conditions and the impact of waste minimisation measures.

Lecture Structure:

	Lecture Title	Tuition	Private Study
U2_L1	Waste Generation	2 hrs	10 hrs

On successful completion of the unit, students will be able to:

Learning Outcomes	<ul style="list-style-type: none">• Identify the different types of waste and their sources• Explain the factors affecting the nature and quantity of waste arisings and general trends over time
Teaching Strategies	<ul style="list-style-type: none">• Lectures – to provide basic introduction to the subject and present the key factual information• Review of case studies• Exercise (e.g. analysis of different waste arisings data/ prediction of future arisings)• Tutorials – to support the lectures and ensure full comprehension
Assessment Strategies	<ul style="list-style-type: none">• Written assignment• Data analysis work• Portfolio work

Unit 3

Waste Management Policy and Legislation

No. of taught hours: 2 (guideline)

No. of student-centred learning hours: 10 (guideline)

Unit status: Mandatory

Unit Overview:

This Unit has been designed as a stand-alone unit on the subject of policy and legislation for the L3VRQ in Principles and Practices of Sustainable Waste Management. The purpose of this unit is to provide all students with the waste management background knowledge and context that they will require in order to successfully complete the subsequent technology-based units.

Before learning about the actual technologies themselves, it is important that students understand the legislation and other drivers that are responsible for the development and introduction of these new technologies. Unit 3 therefore sets the scene by giving an historical perspective to waste management in the UK and the background for the 'step change' in how we now manage our wastes. It outlines the main European legislation that is driving the introduction of new technologies and how the UK is implementing it.

The learning materials have been designed taking into account that some students will have no prior knowledge of the policy and legislation associated with waste management, whilst ensuring that the learning objectives conform to the level required at Level 3.

Lecture Structure:

	Lecture Title	Tuition	Private Study
U3_L1	Policy and Decision making affecting waste management	2 hrs	10 hrs

On successful completion of the unit, students will be able to:

Learning Outcomes	<ul style="list-style-type: none">• Discuss the history of waste management in the UK• List and discuss European and UK legislation that has led to the need to reduce the landfilling of biodegradable waste and to treat waste prior to landfilling• Identify other non-legislative drivers causing a shift away from landfill• Explain why biodegradable waste needs to be treated or disposed in ways other than by landfilling
Teaching Strategies	<ul style="list-style-type: none">• Lectures – to present the key facts• Group discussions (seminar/ class debate)
Assessment Strategies	<ul style="list-style-type: none">• Marked literature review• Assessed class debate• Portfolio work

Unit 4

Roles and responsibilities of Stakeholders involved in Waste Management

No. of taught hours: 2 (guideline)

No. of student-centred learning hours: 10 (guideline)

Unit status: Mandatory

Unit Overview:

This Unit has been designed as a stand-alone unit outlining the roles and responsibilities of the different stakeholders involved in waste management, for the Level 3 in Principles and Practices of Sustainable Waste Management. The purpose of this unit is to provide all students with an appreciation of the functions and responsibilities of those involved in waste management from the producers through to the disposal and regulatory authorities.

Waste is managed by a range of people, companies and authorities from the point of production through to final disposal. Unit 4 explains the different roles and responsibilities at each level of the chain providing the student with an important insight into the management structure of waste in the UK.

The learning materials have been designed taking into account that some students will have no prior knowledge of the institutional layers associated with waste management, whilst ensuring that the learning objectives conform to the level required at Level 3.

Lecture Structure:

	Lecture Title	Tuition	Private Study
U4_L1	Roles and Responsibilities of Different Stakeholders	2 hrs	10 hrs

On successful completion of the unit, students will be able to:

Learning Outcomes	<ul style="list-style-type: none">• Explain the planning and licensing/permitting system applied to waste management• Explain the concept of producer responsibility (Duty of Care)• Identify the roles and responsibilities of different tiers of government with respect to waste planning, collection, treatment/recycling and disposal
Teaching Strategies	<ul style="list-style-type: none">• Lectures – to provide the basic information• Visit to local authority and/or Environment Agency and/or lecture by practitioner• Tutorials – to support the lectures and visits
Assessment Strategies	<ul style="list-style-type: none">• Marked site visit reports• Written assignments• Tutor observation• Portfolio work

Unit 5

Technical Aspects of Waste Management

No. of taught hours: 16 (guideline)

No. of student-centred learning hours: 80 (guideline)

Unit status: Mandatory

Unit Overview:

This Unit has been designed as a stand-alone unit on technical aspects of waste management for the Level 3 in Principles and Practices of Sustainable Waste Management. The purpose of this unit is to provide all students with an appreciation of the various technologies that are available for managing waste.

This Unit forms the bulk of the course and covers the technical aspects associated with the chain of waste management from the collection through to final disposal. The different forms of source segregation are examined and information is provided on techniques used for recycling a range of different materials. The student is given information on established and 'advanced' forms of waste management, including landfill, incineration, composting (windrow and in-vessel), pyrolysis and gasification, anaerobic digestion, mechanical-biological treatment and emerging technologies such as autoclaving. For each technology, a briefing is provided on the science and/or engineering on which it is based, together with common variants. The range of wastes for which it is suitable, the outputs and emissions from the process and the potential benefits and risks associated with the technology are then examined.

The learning materials have been designed taking into account that some students will have no prior knowledge of the collection systems and treatment technologies, whilst ensuring that the learning objectives conform to the level required at Level 3.

Lecture Structure:

	Lecture Title	Tuition	Private Study
U5_L1	Waste Collection	2 hrs	8 hrs
U5_L2	Recycling	2 hrs	8 hrs
U5_L3	Landfill and Incineration	2 hrs	8 hrs
U5_L4	Composting	2 hrs	8 hrs
U5_L5	Anaerobic Digestion	2 hrs	8 hrs
U5_L6	Mechanical-Biological Treatment	2 hrs	8 hrs
U5_L7	Pyrolysis and Gasification	2 hrs	8 hrs
U5_L8	Emerging Technologies	2 hrs	8 hrs

(continued p.6)

(continued from p.5)

On successful completion of the unit, students will be able to:

<p>Learning Outcomes</p>	<ul style="list-style-type: none"> • Outline the different systems available for waste collection and their implications / role in terms of subsequent waste processing • Discuss the recycling technologies applied to different materials • Discuss the scientific and engineering principles of the above processes • Explain how the different processes can be used for the treatment of biodegradable wastes to achieve more sustainable waste management and meet European and UK biodegradable municipal waste diversion targets • List the benefits and limitations of the different processes and any particular problems relating to the processing of biodegradable wastes using the different technologies • Discuss the emissions and products associated with the process • Explain the technical, financial, planning and other barriers limiting the uptake of the different technologies • Identify potential barriers to the implementation of the particular technologies at particular locations • Communicate knowledge, ideas and conclusions about the different technologies to expert and lay audiences using written/ verbal presentations
<p>Teaching Strategies</p>	<ul style="list-style-type: none"> • Lectures – to provide basic introduction to each technology and present the key factual information • Site Visits/ Expert Lectures/ Video presentations – to provide students with more detail about the practical aspects of the technologies • Case studies/technical data – to illustrate how the technologies have performed in practice and how they contributed to meeting the various targets • Supplier videos – showing various technologies in action • Seminars – to stimulate discussion on specific aspects/practical application of the technologies • Tutorials – to support the lectures and other teaching methods to ensure full comprehension
<p>Assessment Strategies</p>	<ul style="list-style-type: none"> • Marked site visit reports • Written assignments • Marked literature reviews • Tutor observation • Portfolio work

Unit 6

Health and Safety in the Waste Management Industry

No. of taught hours: 2 (guideline)

No. of student-centred learning hours: 10 (guideline)

Unit status: Mandatory

Unit Overview:

This Unit has been designed as a stand-alone unit on the subject of health and safety for the Level 3 in Principles and Practices of Sustainable Waste Management. The purpose of this unit is to provide all students with an appreciation of the general principles of, and legal requirements associated with, health and safety (H&S) and the role of health and safety in waste management.

Health and safety is an important issue in all industries. The recent poor health and safety record in the waste management industry has brought this sector into focus. It is important therefore that the student understands the legislative background to health and safety in the UK and the respective roles of the employer and the employee. The management of risk is an important tool in the implementation of health and safety procedures and this unit describes a variety of hazards and methods of prevention.

More specific H&S issues relating to the different aspects of waste management are then explained including the impact of new management arrangements (e.g. fortnightly waste collections) and new technologies (e.g. bio-aerosols associated with composting).

The learning materials have been designed taking into account that some students will have no prior knowledge of health and safety legislation and practices, whilst ensuring that the learning objectives conform to the level required at Level 3.

Lecture Structure:

	Lecture Title	Tuition	Private Study
U6_L1	Health and Safety	2 hrs	10 hrs

On successful completion of the unit, students will be able to:

Learning Outcomes	<ul style="list-style-type: none">• Outline general health and safety principles• Demonstrate the ability to recognise unsafe practices and potentially hazardous practices• List the specific health and safety issues related to advanced waste management technologies
Teaching Strategies	<ul style="list-style-type: none">• Lecture – to provide introduction to the subject including general principles• Video presentation/ examination of case studies – to demonstrate real-life issues and illustrate the practical aspects of H&S• Seminars – to stimulate discussion on extent of responsibilities and practical aspects of applying H&S principles to waste management
Assessment Strategies	<ul style="list-style-type: none">• Written assignment• Marked case study review• Assessed class debate• Portfolio work

Unit 1

Lecture by Lecture Outlines

Principles of Sustainability and its impact on Waste Management

Lecture 1 – Principles of Sustainability

No. of PowerPoint Slides: 49 + 8
 No. of taught hours: 2 (guideline)
 No. of student-centred learning hours: 10

Lecture Overview:

This lecture introduces the general concept of sustainable development through an overview of the international agreements and an examination of some of the impacts development and waste management has had on climate, the ozone layer and ecosystems. The balance between the environment, economics and development is explored with reference to the Triple Bottom Line and the use of environmental assessments. The principles of sustainable waste management including the Waste Hierarchy, the Proximity Principle, and the Precautionary Principle, the Polluter Pays Principle, the Prevention Principle and the philosophy of Zero Waste are introduced and explained.

Overall Aims:

On completion of this unit and the presentation of the accompanying materials, the student will have the knowledge and understanding of:

- The concept of sustainable development
- The definition of waste
- Sustainable waste management principles

	Description 1	Description 2	Description 3
Lecture Outline	Sustainable development	Environmental sustainability Balance with Economics Balance with Development	Introduction to theory of sustainability– what does sustainability mean – different definitions Environmental/Resource impacts Development vs. consumerism Application to specific developments – SEA and sustainability appraisals
	Sustainable Waste Management	Waste Management	Definition of waste Scale of the problem, and measuring waste
		Sustainable Waste Management	Waste hierarchy Waste minimisation vs recycling Zero waste concept Practicalities

Student activities	<ul style="list-style-type: none"> • The accompanying PowerPoint slides provide up to nine discussion topics and exercises
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National Occupational Standards relevant to this Unit include:

NOS Mapping	<ul style="list-style-type: none"> • Control improvements to waste management operations (E19 N7v1) • Encourage and involve people in community recycling (EC18) • Identify improvements to energy efficiency (CHEM3.14) • Promote Recycling Services (Reference ID: not provided) • Contribute to the sustainability, maintenance and preservation of the environment (Reference ID: not provided)
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Waste generation in the UK

Lecture 1 – Waste generation in the UK

No. of PowerPoint slides: 56 + 4

No. of taught hours: 2 (guideline)

No. of student-centred learning hours: 10

Lecture Overview:

This lecture covers the different types of waste, including common definitions and classifications, and the most important characteristics of different waste types. The significance of biodegradable municipal waste is introduced in terms of its potential environmental impact and the requirements of EC and UK landfill legislation. The changing nature of waste over time is traced and the effect of socio-economic factors on waste generation is explored. Some of the different collection and minimisation initiatives associated with household waste are outlined and the effects of EU Directives on a selection of specific waste streams are described.

Overall Aims:

On completion of this unit and the presentation of the accompanying materials, the student will have the knowledge and understanding of:

- The different types of waste
- The key properties of waste and their influence on treatment / disposal
- The importance of BMW
- The reasons behind changes in waste composition and quantity

	Description 1	Description 2	Description 3
Lecture Outline	Different types of waste	Waste classifications	Different categories/classifications of waste: MSW, Industrial, Commercial, Hazardous, etc
		Key properties	Moisture content, calorific value, specific material content and their importance in terms of treatment/disposal
		Relevance of BMW	Potential impact – landfill gas – greenhouse gases
	Factors affecting waste generation	General trends over time	Brief history of MSW waste generation – changing composition and quantity of waste over time
		Socio-economic factors	Impact on waste composition and amounts of waste
		Waste reduction initiatives	Specific (target) materials- packaging, batteries, WEEE etc

Student activities	<ul style="list-style-type: none"> • The accompanying PowerPoint slides provide one group exercise and three individual exercises
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National Occupational Standards relevant to this Unit include:

NOS Mapping	<ul style="list-style-type: none"> • There are no National Occupational Standards relevant to this Unit
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Unit 3

Lecture by Lecture Outlines

Waste Management Policy and Legislation

Lecture 1 – Policy and Legislation affecting Waste Management

No. of PowerPoint Slides: 40 + 5

No. of taught hours: 2

No. of student-centred learning hours: 10

Lecture Overview:

This lecture gives an historical perspective to waste management in the UK – explaining the previous heavy reliance on landfill and hence the need for a ‘step change’ in how we now manage our wastes. It outlines the main European legislation that is driving the introduction of new technologies and how the UK is implementing it.

Overall Aims:

On completion of this unit and the presentation of the accompanying materials, the student will have the knowledge and understanding of:

- Previous UK waste management methods
- Key EU legislation affecting waste management
- National waste legislation and policy in the UK

	Description 1	Description 2	Description 3
Lecture Outline	Historical perspective	Review of how the UK has managed waste previously	Why the UK has relied so heavily on landfill until now
	European Legislation	Overview of the main legislation that has impacted on how wastes are managed	Waste Framework directive Landfill Directive
	UK Legislation	Overview of how the UK has implemented the various EC Directives	EPA 1990 PPC Regulations 2000 WET Act /LATS Producer Responsibility
		Waste Policy- national, regional and local initiatives	Waste Strategy 2000

Student activities	<ul style="list-style-type: none">• The accompanying PowerPoint slides provide four group exercises
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National Occupational Standards relevant to this Unit include:

NOS Mapping	<ul style="list-style-type: none">• There are no National Occupational Standards relevant to this Unit.
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Unit 4

Lecture by Lecture Outlines

Roles and Responsibilities of stakeholders in Waste Management

Lecture 1 – Roles and Responsibilities of stakeholders in Waste Management

No. of PowerPoint Slides: 37

No. of taught hours: 2

No. of student-centred learning hours: 10

Lecture Overview:

In this lecture, the institutional aspects of waste management in the UK are explained, by reference to the legally defined functions and responsibilities of waste producers, the planning, collection, disposal and regulatory authorities and private waste management companies. The use of Duty of Care documentation and transfer notes is explained and the role of local authorities in the management of waste is discussed. The role of the private sector in collection and disposal systems is explored and the duties of regulation and enforcement bodies are considered. Finally, an overview of the importance of public engagement is presented.

Overall Aims:

On completion of this unit and the presentation of the accompanying materials, the student will have the knowledge and understanding of:

- The legal responsibilities of waste producers
- The roles and responsibilities of different authorities in waste management
- The involvement of the private sector in waste management
- Regulation and enforcement in the waste management sector

	Description 1	Description 2	Description 3
Lecture Outline	Legally defined functions and responsibilities relating to waste management	Waste producers responsibilities	Duty of care
		Waste management planning Waste collection Recycling, treatment and disposal	Roles of Planning, Waste Collection and Waste Disposal Authorities including Unitary Authorities Private sector role in waste management (Including PFI)
		Regulation/ enforcement	Environment Agency and other regulators involved in waste management

Student activities	<ul style="list-style-type: none">• The accompanying PowerPoint slides provide two discussion topics
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National Occupational Standards relevant to this Unit include:

NOS Mapping	<ul style="list-style-type: none">• Control Improvements to waste management operations (E19N7v1)
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Unit 5

Lecture by Lecture Outlines

Technical Aspects of Waste Management

Lecture 1 – Waste Collection

No. of PowerPoint Slides: 60

No. of taught hours: 2 (guideline)

No. of student-centred learning hours: 10 (guideline)

Lecture Overview:

This lecture introduces to the student the subject of waste collection. The roles and responsibilities of the Waste Collection Authority are described. The segregation of materials and the collection of mixed waste are described and compared. Different methods of recycling collection of recycling collections including bring banks and household waste recycling centres are explored and specific examples of high achieving councils are highlighted. Collection logistics are considered and methods for monitoring performance described. A brief overview of specific targeted waste streams is also presented.

Overall Aims:

On completion of this unit and the presentation of the accompanying materials, the student will have the knowledge and understanding of:

- The duties of the Waste Collection Authority
- The effects of collecting mixed or segregated waste
- The range of different collection systems
- Influence of the frequency of collections
- Recycling collection monitoring methods

	Description 1	Description 2	Description 3
Lecture Outline	Waste Collection including the role and different types of separation at source	Waste collection	History of waste collection Collection systems Waste collection authorities
		Mixed Waste	Mixed waste vs. segregation of materials
		Segregation at source	Mixed waste collection systems Household recycling
		Different types of containers	Types of systems Kerbside recycling Co-mingled collection systems Bring systems Household and kerbside collections
		Frequency of collection	Household/kerbside recycling collections Examples :Lichfield Daventry
		Logistics of collection systems	Vehicles Personnel and personnel training Costs Legislation
		Monitoring	Coverage, participation and capture Evaluation Contamination and costs Battery collections WEEE Packaging

Student activities

- The accompanying PowerPoint slides provide one group discussion topic, and one group exercise

National Occupational Standards relevant to this Unit include:**NOS Mapping**

- Sort and prepare recyclable materials for processing (reference ID: not provided)
- Prepare to drive the vehicle (reference ID: DI01)
- Demonstrate safe driving (reference ID: DI02)
- Control the movement, sorting and storage of non-hazardous waste (Reference ID: not provided)
- Operate a vehicle safely and efficiently (reference ID: not provided)
- Control the movement of recyclable materials (reference ID: not provided)
- Select and use containers (reference ID: not provided)
- Assist in the collection of recyclable materials (reference ID: not provided)
- Assist in the handover of recyclable materials (reference ID: not provided)
- Assist in the safe operation of the work vehicle during recycling operations (reference ID: not provided)
- Clean and maintain processing facilities and equipment (reference ID: not provided)
- Assist in the sorting and preparation of recyclable materials for processing (reference ID: not provided)
- Mechanically handle recyclable materials (reference ID: not provided)
- Control the handover of recyclable materials (reference ID: not provided)
- Sort and prepare recyclable materials for processing (reference ID: not provided)
- Collect recyclable materials (reference ID: not provided)
- Control vehicle movements on site (reference ID: not provided)

Unit 5

Lecture by Lecture Outlines

Technical Aspects of Waste Management

Lecture 2 – Recycling

No. of PowerPoint Slides: 83

No. of taught hours: 2 (guideline)

No. of student-centred learning hours: 10 (guideline)

Lecture Overview:

This lecture describes the methods used to resize, separate and recover material from specific waste streams. The student is introduced to each of the common unit operations for recycling, starting first with all the resizing technologies, and then covering the sorting and separation technologies. An exercise is then used to challenge the students to put the pieces of equipment into a plausible order for the operation of a MRF, before presenting slides and videos of some actual applications.

The final section of the lecture briefly covers what are suitable waste streams for MRFs, what products, emissions & residues arise, the environmental benefits of MRFs, and possible problems and issues associated with the technology.

An annex is also provided, with a relatively detailed description of recycling processes for Waste Electrical and Electronic Equipment (WEEE), including three examples of operating WEEE recovery facilities.

Overall Aims:

On completion of this unit and the presentation of the accompanying materials, the student will have the knowledge and understanding of:

- Waste recycling technologies – dirty vs clean MRFs
- Various pieces of equipment capable of performing waste resizing operations
- Various pieces of equipment capable of performing waste sorting and separation operations
- How these unit operations can be built into a MRF

	Description 1	Description 2	Description 3
Lecture Outline Student activities	Waste Recycling Technologies	Scientific and engineering principles involved	
		Resizing	Hammer Mill Ball Mill Shredder Rotating Drum Wet Rotating Drum with Knives Bag Splitter Pre-Baling Operations Baling
		Sorting/ Separation	Tipping Manual Handling Trommels and Screens Magnetic Separation Eddy Current Separation Wet, Air or Ballistic Separation Disc Screen and Debris-Roll Separation Optical Separation
		Applications	Cleanaway Greenwich Ken Mills Engineering Norfolk Grundon Cleanaway Rainham Wastec

(continued from p.14)

Lecture Outline Student activities	Description 1	Description 2	Description 3
	Waste Recycling Technologies	Scientific and engineering principles involved	
		Suitable waste streams for treatment	
		Products, emissions & residues	
		Environmental benefits	
		Problems and issues associated with the technology	

Student activities	<ul style="list-style-type: none"> • The accompanying PowerPoint slides provide one group discussion topic and one individual exercise. • There are also two process videos that can be used to challenge the students' critical appraisal skills.
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National Occupational Standards relevant to this Unit include:

NOS Mapping	<ul style="list-style-type: none"> • Prepare raw materials and equipment for processing (reference ID: MPA9) • Promote recycling services (reference ID: not provided) • Control site operations for the treatment of non-hazardous wastes (reference ID: not provided) • Control the movement, sorting and storage of non-hazardous waste (reference ID: not provided) • Control the reception of non-hazardous waste (reference ID: not provided) • Control the movement, sorting and storage of non-hazardous waste (Reference ID: not provided) • Control the reception of non-hazardous waste (Reference ID: not provided) • Control the movement of recyclable materials (reference ID: not provided) • Assist in operating equipment for the processing of recyclable materials (reference ID: not provided) • Assist in the handover of recyclable materials (reference ID: not provided) • Assist in the safe operation of the work vehicle during recycling operations (reference ID: not provided) • Clean and maintain processing facilities and equipment (reference ID: not provided) • Contribute to the security of processing facilities (reference ID: not provided) • Assist in the sorting and preparation of recyclable materials for processing (reference ID: not provided) • Assist in the maintenance of plant and equipment for processing (reference ID: not provided) • Mechanically handle recyclable materials (reference ID: not provided) • Control the handover of recyclable materials (reference ID: not provided) • Control the reception of recyclable materials (reference ID: not provided) • Sort and prepare recyclable materials for processing (reference ID: not provided) • Carry out routine checks on vehicles and plant used for the processing of recyclable materials (reference ID: not provided) • Operate specialised plant and equipment for the processing of recyclable materials (reference ID: not provided) • Control vehicle movements on site (reference ID: not provided) • Facilitate the maintenance of plant and equipment for the processing of recyclable materials (reference ID: not provided) • Prepare and check plant and equipment for the processing of recyclable materials (reference ID: not provided) • Operate plant for the processing of recyclable materials (reference ID: not provided) • Monitor and maintain the security of facilities used for the processing or storage of recyclable materials v2 (reference ID: not provided)
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Unit 5

Lecture by Lecture Outlines

Technical Aspects of Waste Management

Lecture 3 – Landfill and incineration

No. of PowerPoint Slides: 102

No. of taught hours: 2 (guideline)

No. of student-centred learning hours: 10

Lecture Overview:

This lecture provides a briefing on the science, together with common variants, of landfill and mass burn incineration. The design and operation of landfills and a variety of incinerator types are discussed. The range of wastes for which each is suitable, the outputs and emissions from the processes and the potential benefits and risks associated with the technologies are then examined.

Overall Aims:

On completion of this unit and the presentation of the accompanying materials, the student will have the knowledge and understanding of:

- The principles of landfill and incineration
- The emissions from landfill and incineration and their control methods
- Process outputs of incineration

	Description 1	Description 2	Description 3
Lecture Outline	Landfill	History	Reliance of the UK pre-1960
		Scientific and engineering principles involved	Landfill design Landfill operations
		Recent developments	Bioreactor philosophy
		Waste and waste streams for treatment	Landfill
		Products, emission and residues generated	Emissions – landfill gas, odours, dust, leachate
		Problems associated with landfill	Problems associated with landfill
	Mass Burn Incineration	History	Brief history of mass burn incineration
		Scientific and engineering principles involved	Thermal treatment Combustion stages Factors controlling combustion Architectural design
		Recent developments	Fluidised bed incinerators Legislation
		Waste and waste streams for treatment	Suitable types of waste Other requirements
	Products, emission and residues generated	Impacts of waste: composition/contamination Process outputs Energy generation Combined heat and power system Pollutant emissions Metals recovery Waste water	

Student activities

- The accompanying PowerPoint slides provide two group discussion topics

National Occupational Standards relevant to this Unit include:**NOS Mapping**

- Prepare raw materials and equipment for processing (MPA9)
- Control site operations for the treatment of non-hazardous wastes (Reference ID: not provided)
- Control the reception of non-hazardous waste (Reference ID: not provided)
- Control the movement, sorting and storage of non-hazardous waste (Reference ID: not provided)

Unit 5

Lecture by Lecture Outlines

Technical Aspects of Waste Management

Lecture 4 – Composting

No. of PowerPoint Slides: 97

No. of taught hours: 2 (guideline)

No. of student-centred learning hours: 10 (guideline)

Lecture Overview:

This lecture provides an introduction to the science behind composting. The advantages and disadvantages of composting are described and the levels at which composting can be applied are detailed. A thorough assessment of the different configurations of the technology is presented. Outputs and their possible markets and process risks and benefits are covered, giving the full picture of the suitability of the technology for waste management.

Overall Aims:

On completion of this unit and the presentation of the accompanying materials, the student will have the knowledge and understanding of:

- The science of composting
- The variety of composting technologies
- Outputs of composting and their markets
- Environmental benefits of composting and its relevance to BMW legislation

	Description 1	Description 2	Description 3
Lecture Outline	Composting including windrow and in-vessel	Introduction	Types and definitions of biological decomposition Advantages/ Disadvantages History Main Drivers: Landfill Directive
		Scientific and engineering principles involved	Levels of composting Open process Closed process
		Suitable waste streams for treatment	British standard waste Types of waste Suitable feedstocks
		Outputs/products, emissions and residues	Current standards Pasteurisation Sterilisation Marketability Markets/ Predictions Emissions and residues
		Environmental benefits	Reduction of methane production and landfill use
		Problems associated with Composting	Potential environmental & health effects Fire and explosions NVZ's Cost considerations Public perception Product perception Planning

Student activities

- The accompanying PowerPoint slides provides one group exercise, and one home study exercise
- There are also up to six process videos that can be used to challenge the students critical appraisal skills

National Occupational Standards relevant to this Unit include:**NOS Mapping**

- Prepare raw materials and equipment for processing (MPA9)
- Control site operations for the composting of biodegradable wastes (Reference ID: not provided)
- Control site operations for the treatment of non-hazardous wastes (Reference ID: not provided)
- Control the movement, sorting and storage of non-hazardous waste (Reference ID: not provided)
- Control the reception of non-hazardous waste (Reference ID: not provided)

Unit 5

Lecture by Lecture Outlines

Technical Aspects of Waste Management

Lecture 5 – Anaerobic digestion

No. of PowerPoint Slides: 75

No. of taught hours: 2 (guideline)

No. of student-centred learning hours: 10 (guideline)

Lecture Overview:

This lecture provides an introduction to the science behind Anaerobic Digestion (AD). The advantages and disadvantages of AD are described and the historical context and drivers behind the technology are considered. A thorough assessment of the different configurations of the technology is presented. Outputs and their possible markets and process risks and benefits are covered, giving the full picture of the suitability of the technology for waste management.

Overall Aims:

On completion of this unit and the presentation of the accompanying materials, the student will have the knowledge and understanding of:

- The science of anaerobic digestion
- The variety of anaerobic digestion technologies
- The outputs of anaerobic digestion and their markets
- The environmental benefits of anaerobic digestion and its relevance to BMW legislation
- The disadvantages of anaerobic digestion

	Description 1	Description 2	Description 3
Lecture Outline	Anaerobic digestion	Introduction	Types and definitions of biological decomposition Process Definition of AD Historical context Main drivers: Landfill Directive, ROC's
		Scientific and engineering principles involved	Chemistry of AD Example of plant Advantages/Disadvantages of AD Process description Conditions and variables Design options: Mesophilic, Thermophilic, Dry, Wet, One stage, two stage, MSW, Co-digestion
		Suitable waste streams for treatment	Suitable feedstocks Impact on digestate
		Outputs/products, emissions and residues	Output products By-products and treatment: Biogas, Digestate Application of different mixes Pasteurisation & sterilisation Market for output products Processing costs vs. retail sales Emissions and residues
		Environmental benefits	Reduction of methane production
		Problems and issues associated with the technology	Potential environmental and health effects Economic, financial and investment appraisal Public perception Planning

Student activities

- The accompanying PowerPoint slides provide three group exercises
- There are also up to three process videos that can be used to challenge the students critical appraisal skills

National Occupational Standards relevant to this Unit include:**NOS Mapping**

- Prepare raw materials and equipment for processing (MPA9)
- Control site operations for the composting of biodegradable wastes (Reference ID: not provided)
- Control site operations for the treatment of non-hazardous wastes (Reference ID: not provided)
- Control the movement, sorting and storage of non-hazardous waste (Reference ID: not provided)
- Control the reception of non-hazardous waste (Reference ID: not provided)

Unit 5

Lecture by Lecture Outlines

Technical Aspects of Waste Management

Lecture 6 – Mechanical-Biological Treatment

No. of PowerPoint Slides: 99

No. of taught hours: 2 (guideline)

No. of student-centred learning hours: 10 (guideline)

Lecture Overview:

This lecture provides an introduction to the science behind Mechanical Biological Treatment (MBT). The advantages and disadvantages of MBT are described and the historical context and drivers behind the technology are considered. A thorough assessment of the different configurations of the technology is presented. Outputs and their possible markets and process risks (including health and safety issues) and benefits are covered, giving the full picture of the suitability of the technology for waste management. The lecture also covers some examples of Mechanical Heat Treatment, as alternative examples of integrated systems.

Overall Aims:

On completion of this unit and the presentation of the accompanying materials, the student will have the knowledge and understanding of:

- The different methods of MBT
- The by-products of MBT and their markets/ treatment
- The relevance of MBT to the Landfill Directive

	Description 1	Description 2	Description 3
Lecture Outline	Mechanical-Biological Treatment (MBT)	Introduction and history	Post MBT MBT general process History of MBT process elements
		Scientific and engineering principles involved	Waste preparation and separation technologies Biological treatment Plant examples Commercially available systems Pre-sort preparation Manual sorting Mechanical preparation/sorting technologies
		Products, emissions and residues generated	Products associated with MBT process By products: biogas, CLO, RDF, recyclables, metals
		Environmental benefits	Environmental benefits
		Problems and issues associated with the technology	Quality issues of compost Kerbside collection schemes Public perceptions Health issues

Student activities	<ul style="list-style-type: none">• The accompanying PowerPoint slides provide two group exercises, one individual exercise and one home study exercise• There are also up to nine process videos that can be used to challenge the students' critical appraisal skills
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National Occupational Standards relevant to this Unit include:

NOS Mapping	<ul style="list-style-type: none"> • Prepare raw materials and equipment for processing (Reference ID: MPA9) • Control site operations for the composting of biodegradable wastes (Reference ID: not provided) • Control site operations for the treatment of non-hazardous wastes (Reference ID: not provided) • Control the movement, sorting and storage of non-hazardous waste (Reference ID: not provided) • Control the reception of non-hazardous waste (Reference ID: not provided) • Prepare raw materials and equipment for processing (reference ID: MPA9) • Promote recycling services (reference ID: not provided)) • Control site operations for the treatment of non-hazardous wastes (reference ID: not provided) • Control the movement, sorting and storage of non-hazardous waste (reference ID: not provided) • Control the reception of non-hazardous waste (reference ID: not provided) • Control the movement, sorting and storage of non-hazardous waste (Reference ID: not provided) • Control the reception of non-hazardous waste (Reference ID: not provided) • Control the movement of recyclable materials (reference ID: not provided) • Assist in operating equipment for the processing of recyclable materials (reference ID: not provided) • Assist in the handover of recyclable materials (reference ID: not provided) • Assist in the safe operation of the work vehicle during recycling operations (reference ID: not provided) • Clean and maintain processing facilities and equipment (reference ID: not provided) • Contribute to the security of processing facilities (reference ID: not provided) • Assist in the sorting and preparation of recyclable materials for processing (reference ID: not provided) • Assist in the maintenance of plant and equipment for processing (reference ID: not provided) • Mechanically handle recyclable materials (reference ID: not provided) • Control the handover of recyclable materials (reference ID: not provided) • Control the reception of recyclable materials (reference ID: not provided) • Sort and prepare recyclable materials for processing (reference ID: not provided) • Carry out routine checks on vehicles and plant used for the processing of recyclable materials (reference ID: not provided) • Operate specialised plant and equipment for the processing of recyclable materials (reference ID: not provided) • Control vehicle movements on site (reference ID: not provided) • Facilitate the maintenance of plant and equipment for the processing of recyclable materials (reference ID: not provided) • Prepare and check plant and equipment for the processing of recyclable materials (reference ID: not provided) • Operate plant for the processing of recyclable materials (reference ID: not provided) • Monitor and maintain the security of facilities used for the processing or storage of recyclable materials v2 (reference ID: not provided)
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Unit 5

Lecture by Lecture Outlines

Technical Aspects of Waste Management

Lecture 7 – Pyrolysis and Gasification

No. of PowerPoint Slides: 73

No. of taught hours: 2 (guideline)

No. of student-centred learning hours: 10 (guideline)

Lecture Overview:

This lecture provides an introduction to the science behind pyrolysis and gasification in the treatment of waste. The advantages and disadvantages of both are described and the historical context and drivers behind the technology are considered. A thorough assessment of both processes is presented including the pollution control technology associated with the technologies. Outputs and their possible markets and process risks and benefits are covered, giving the full picture of the suitability of the technology for waste management.

Overall Aims:

On completion of this unit and the presentation of the accompanying materials, the student will have the knowledge and understanding of:

- The science and engineering of both technologies and the difference between them and mass burn incineration
- The pollution control technology associated with both technologies
- The by-products of both processes and their treatment/ markets

	Description 1	Description 2	Description 3
Lecture Outline	Pyrolysis and Gasification	History	Description of early pyrolysis and gasification
		Scientific and engineering principles involved	Thermal processes Types of gasification Chemistry of gasification Gasification process
		Waste and waste streams for treatment	Suitable wastes RDF's
		Products, emissions and residues generated	Syngas: flue gas, particulates, heavy metals, toxic and corrosive gases, dioxins and furans
		Combined processes	Oxidation Examples of gasification Pyrolysis Advanced thermal treatment
		Environmental benefits	Environmental benefits
		Problems and issues associated with pyrolysis and gasification	Problems and issues associated with pyrolysis and gasification
		Recent developments	New technologies programme DTI Carbon abatement techniques

Student activities

- The accompanying PowerPoint slides provide one group discussion exercise
- There are also up to two process videos that can be used to challenge the students' critical appraisal skills

National Occupational Standards relevant to this Unit include:**NOS Mapping**

- Prepare raw materials and equipment for processing (MPA9)
- Control site operations for the treatment of non-hazardous wastes (Reference ID: not provided)
- Control the movement, sorting and storage of non-hazardous waste (Reference ID: not provided)
- Control the reception of non-hazardous waste (Reference ID: not provided)

Unit 5

Lecture by Lecture Outlines

Technical Aspects of Waste Management

Lecture 8 – Emerging Technologies

No. of PowerPoint Slides: 56

No. of taught hours: 2 (guideline)

No. of student-centred learning hours: 10 (guideline)

Lecture Overview:

This lecture discusses four emerging waste treatment technologies. The science and engineering behind each technology is presented and suitable waste streams are identified. Outputs and their possible markets and process risks and benefits are covered. In addition, the environmental benefits of each waste technology are presented. Potential problems and issues of the emerging technologies are highlighted. An annex is provided which discusses a further nine technologies.

Overall Aims:

On completion of this unit and the presentation of the accompanying materials, the student will have the knowledge and understanding of:

- The technical basis of each technology
- The potential role that may be played by each emergent technology
- The by-products of the processes and their treatment/ markets

	Description 1	Description 2	Description 3
Lecture Outline	Emerging technologies	Hydrogen production	Scientific and engineering principles Suitable waste streams Products, emissions and residues Environmental benefits Potential problems
		Ethanol production	Scientific and engineering principles Suitable waste streams Products, emissions and residues Environmental benefits Potential problems
		Autoclaving	Scientific and engineering principles Suitable waste streams Products, emissions and residues Environmental benefits Potential problems
		Microwaving	Scientific and engineering principles Suitable waste streams Potential problems

Student activities

- The accompanying Power Point slides provides an autoclaving process video that can be used to challenge the students' critical appraisal skills

National Occupational Standards relevant to this Unit include:**NOS Mapping**

- Prepare raw materials and equipment for processing (MPA9)
- Control site operations for the treatment of non-hazardous wastes (Reference ID: not provided)
- Control the movement, sorting and storage of non-hazardous waste (Reference ID: not provided)
- Control the reception of non-hazardous waste (Reference ID: not provided)

Unit 6

Lecture by Lecture Outlines

Health and Safety in the Waste Management Industry

Lecture 1 – Health and safety

No. of PowerPoint Slides: 59

No. of taught hours: 2

No. of student-centred learning hours: 10

Lecture Overview:

This lecture introduces the student to the legislative background to health and safety in the UK and describes the track record of the waste management industry. The concept of risk assessment and hazard identification in health and safety is explored. Preventative measures are considered including responsible practices, the provision of personal protective equipment and the availability of training for supervisors. The specific issues associated with individual waste management technologies are discussed and the outcomes of the Defra health study are presented.

Overall Aims:

On completion of this unit and the presentation of the accompanying materials, the student will have the knowledge and understanding of:

- Health and safety policy and legislation in the UK
- The current health and safety record in the waste management industry
- Risk assessment and hazard identification in the waste management industry
- Preventative measures

	Description 1	Description 2	Description 3
Lecture Outline	Health and safety considerations associated with the different stages of waste management	Health and safety in the Waste Management industry	Health and safety in the UK HSE Causes and statistics
		Legal requirements	Responsibilities of different persons involved in waste management chain- duty of care
		Risk and risk assessment	HSE Risk assessment methods Hazard types
		Prevention	General hygiene practices Immunisation Responsible practices Personal protective equipment
		Specific issues associated with new technologies/ systems	MSW Treatment sites OHSMS Transfer stations Landfills Mechanical and biological treatment Defra health study WAMITAB

Student activities

- The accompanying PowerPoint slides provides up to seven group discussion exercises

National Occupational Standards relevant to this Unit include:**NOS Mapping**

- Control improvements to waste management operations (E19N7v1)
- Control maintenance and other engineering operations (Reference ID: not provided)
- Meet safety, health and environmental requirements in the workplace (POLYM1)
- Monitor and manage the environmental and resources during and after clinical/therapeutic activities (Reference ID: not provided)
- Monitor procedures to control risks to health and safety (E19N3v1)
- Assisting in the installation of environmental pollution control equipment (045NEM154)
- Carrying out maintenance on environmental control equipment (045NEM131)
- Commissioning environmental pollution control equipment and systems (IC27)
- Prepare raw materials and equipment for processing (MPA9)
- Ensure your own actions reduce risks to health and safety (MLE5)
- Monitor and maintain health and safety (ECCU2)
- Promote, monitor and maintain health, safety and security (ECCU3)
- Conform to general workplace safety (COVR01)
- Excavate holes and trenches (COVR373)
- Operate specialised powered tools and equipment (COVR400)
- Ensure health and safety requirements are met in your area of responsibility (MLE6)
- Ensure an effective organisational approach to health and safety (MLE7)



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