



Unit Title	Waste water treatment processes (T/506/1607)	
Level	4	
Credit Value	12	
Learning Outcomes – the learner will be able to:	Assessment Criteria – the learner can:	
1. Understand preliminary and primary waste water treatment processes	1.1	explain how the quantity and quality of collected waste water can affect the types of treatment processes required.
	1.2	describe the methods used for the treatment and disposal of gross solids, including: <ul style="list-style-type: none"> (a) the need for the removal of solids (b) disposal options (c) potential problems.
	1.3	describe the main methods used for the treatment and disposal of grit, including: <ul style="list-style-type: none"> (a) the need for grit removal (b) disposal options (c) potential problems.
	1.4	explain the rationale behind the separation, treatment and discharge of storm water and describe how the treatment works is affected.
	1.5	explain the features, operation and effects of the main types of primary sedimentation tanks , what affects the efficiency of each type and their suitability to different circumstances.
	1.6	describe how poor primary treatment can be detrimental to subsequent treatment processes .
2. Understand biological waste water treatment processes	2.1	explain how the main types of micro-organisms involved in the biological treatment of waste water bring about the purification of waste water.
	2.2	describe the main factors which affect the efficiency and effectiveness of micro-organisms covered in the biological treatment of waste water.
	2.3	explain the operation of biological and percolating filters , including: <ul style="list-style-type: none"> (a) the different types and how they work (b) the advantages and disadvantages of each type (c) factors affecting their efficiency and effectiveness.
	2.4	explain the operation of aeration and activated sludge systems , including: <ul style="list-style-type: none"> (a) the principles of the system (b) the advantages and disadvantages of each type of system (c) typical operational problems (d) factors affecting their efficiency and effectiveness.
	2.5	explain how package plants operate when they are based on modifications of biological and percolating filters.
3. Understand tertiary waste water treatment processes	3.1	describe the circumstances that may lead to a requirement for tertiary treatment.
	3.2	describe tertiary treatment systems that involve sedimentation



	<p>as the main principle and the advantages and disadvantages of each.</p> <p>3.3 describe tertiary treatment systems that involve filtration as the main principle and the advantages and disadvantages of each.</p> <p>3.4 describe tertiary treatment systems that incorporate biological treatment as a main principle.</p> <p>3.5 explain the systems and processes used to control and remove nitrogen and phosphorus.</p>
4. Understand sludge treatment and disposal methods	<p>4.1 describe the composition, types, and origins of sludges within both waste water and drinking water treatment systems.</p> <p>4.2 explain the systems used for the natural drying and dewatering of sludges, including the use of lagoons and drying beds.</p> <p>4.3 explain the systems used for the mechanical thickening and dewatering of sludges.</p> <p>4.4 explain the principles and mechanisms of sludge digestion and the systems used.</p> <p>4.5 explain the principles and mechanisms of modern pre-treatment processes which enhance mesophilic anaerobic digestion</p> <p>4.6 describe the main options and methods of final sludge disposal.</p>

Additional information about the unit	
Unit purpose and aims	<p>This unit is designed to enable the learner to develop the skills and knowledge associated with the principles and processes commonly used in primary, secondary and tertiary treatment of waste water and the treatment and disposal of waste water sludges.</p> <p>It is suitable for learners who wish to understand the principles and processes involved in the waste water treatment environment.</p> <p>On completion of the unit the learner will be able to:</p> <ul style="list-style-type: none"> • explain the primary treatment processes used in waste water treatment. • explain the biological treatment processes used in waste water treatment. • explain the main tertiary treatment processes used in waste water treatment. • explain the main methods used for the treatment and disposal of sludge.
Unit expiry date	31/03/2019
Assessment requirements and guidance	In the assessment of this unit, the learner must ensure that the evidence that they produce covers the following:



	<ol style="list-style-type: none">1. The explanation of how quality and quantity of collected waste water affects treatment processes must include reference to:<ol style="list-style-type: none">(a) at least four quality and quantity characteristics(b) the concept of Dry Weather Flow (DWF)(c) the classifications of solids. 2. The subsequent treatment processes that can be affected by poor quality bio-solids and settled sewage as a result of poor primary treatment are:<ol style="list-style-type: none">(a) biological treatment (ASP and biological filtration)(b) biosolids thickening and dewatering(c) mesophilic anaerobic digestion(d) combined heat and power. 3. Types of micro-organisms must include:<ol style="list-style-type: none">(a) aerobic bacteria(b) anaerobic bacteria(c) facultative bacteria(d) nitrifying bacteria(e) protozoan(f) metazoan(g) fungi(h) algae. 4. The explanation of the operation of biological and percolating filters must cover, for circular <u>and</u> rectangular filters:<ol style="list-style-type: none">(a) at least two advantages of each(b) at least two disadvantages of each(c) at least two operating modes (e.g. ADF, DF, Recirc)(d) typical operational problems and solutions. 5. The explanation of the operation of aerated and activated sludge systems must include:<ol style="list-style-type: none">(a) at least three types of operation of aeration and activated sludge systems(b) at least two advantages and disadvantages of each type. 6. The description of the circumstances that may lead to a requirement for tertiary treatment must cover at least two instances of when tertiary treatment may be required. 7. The descriptions of tertiary treatment systems (at ACs 2.2, 2.3 and 2.4) must cover:<ol style="list-style-type: none">(a) at least three examples of tertiary treatment systems that involve sedimentation as the main principle, and two advantages and two
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- disadvantages of each system
- (b) at least three examples of tertiary treatment systems that involve filtration of some kind as the main principle, and two advantages and two disadvantages of each system.
- (c) at least two examples of tertiary treatment systems that involve biological treatment as a main principle.
8. The description of the **composition, types and origins of sludges** in waste water and drinking water treatment systems must include:
- (a) primary
- (b) humus
- (c) surplus activated
- (d) iron and aluminium sludges
- (e) organic
- (f) inorganic
- (g) solids percentage composition.
9. The explanation of the systems used for **mechanical thickening and dewatering of sludges** must include:
- (a) aluminium
- (b) iron
- (c) lime
- (d) polymer addition
- (e) consolidation
- (f) dewatering
- (g) picket fence systems
- (h) centrifuges
- (i) filter presses
- (j) belt presses.
10. The explanation of the principles and mechanisms of **sludge digestion** and the systems used must include:
- (a) aerobic digestion vs. anaerobic digestion
- (b) mesophilic anaerobic digestion.
11. The explanation of the principles and mechanisms of **modern pre-treatment processes** which enhance mesophilic anaerobic digestion must include:
- (a) enzymic hydrolysis
- (b) enhanced enzymic hydrolysis
- (c) thermal hydrolysis.
12. The description of the main options and methods of **final sludge disposal** must include:
- (a) landfill
- (b) agricultural
- (c) composting
- (d) thermal drying



	<p>(e) palletisation (f) incineration.</p> <p>The assessment of this unit will be via a combination of centre-devised assignments and tests, and will be conducted in supervised conditions. The assessment strategy for the unit has been agreed with industry stakeholders.</p>
Location of the unit within the subject/sector classification system	4.1 Engineering
Name of the organisation submitting the unit	CABWI Awarding Body
Availability for use	Shared
Unit guided learning hours	48