



Unit Title	Activated sludge and advanced waste water treatment processes (J/506/1613)	
Level	4	
Credit Value	12	
Learning Outcomes – the learner will be able to:	Assessment Criteria – the learner can:	
1. Understand scientific aspects of the activated sludge processes	1.1	describe methods used to investigate the biology and biochemistry of activated sludge.
	1.2	describe the chemistry of activated sludge.
	1.3	describe the conditions required for nitrification and denitrification.
	1.4	explain key health and safety hazards and relevant safe practice in the operation of activated sludge plants.
2. Understand assets involved in the activated sludge processes	2.1	describe the function of common components of an activated sludge plant.
	2.2	describe the maintenance of plant and equipment used in activated sludge treatment.
	2.3	describe the waste water industry design criteria applied to activated sludge treatment.
3. Understand activated sludge processes control	3.1	explain the principles of operation of the activated sludge treatment process.
	3.2	describe the process control systems .
	3.3	define the technical terminology and units of measurement used in activated sludge treatment process control.
4. Understand the settlement of activated sludge and final settlement tank design	4.1	describe the process of settlement of activated sludge.
	4.2	describe the measurement of the settling characteristics of mixed liquor.
	4.3	identify causes of bulking and the associated groups of organisms.
	4.4	examine methods for the prevention and control of bulking.
	4.5	calculate final settlement loadings .
5. Understand the process variations used in advanced waste water treatment	5.1	describe process variations of the activated sludge processes.
	5.2	evaluate process variations using the activated sludge process.
	5.3	conduct process control calculations to design an activated sludge plant.
	5.4	describe chemical and biological nutrient removal processes .
6. Understand the remedial processes for non-compliance	6.1	describe failure modes and common faults with activated sludge plants and other advanced waste water treatment processes.
	6.2	identify and explain how to rectify faults causing poor effluent quality from activated sludge plants.
	6.3	analyse process diagnostic data .
	6.4	evaluate process solutions to achieve compliance.



Additional information about the unit	
Unit purpose and aims	<p>This unit is designed to provide the learner with an understanding of the principles and practices involved in the activated sludge and advanced waste water treatment processes.</p> <p>On completion of this unit the learner will be able to:</p> <ul style="list-style-type: none">• explain the activated sludge processes in waste water treatment.• explain the settlement of activated sludge and final settlement tank design.• evaluate the process variations used in advanced waste water treatment.• evaluate remedial processes for non-compliance.
Unit expiry date	31/03/2019
Assessment requirements and guidance	<p>Learners are expected to complete Unit WOM405 – <i>Waste water treatment processes</i> – before undertaking this unit.</p> <p>In the assessment of this unit, the learner must ensure that the evidence that they produce covers the following:</p> <ol style="list-style-type: none">1. The learner must describe two examples of methods used to investigate the biology and biochemistry of activated sludge.2. The learner's description of the chemistry of activated sludge, to cover two processes, including chemical equations.3. The learner must describe four key conditions required for nitrification and de-nitrification.4. The learner must explain four health and safety hazards, and the safe working practices required to control them.5. The learner's description of the common components of an activated sludge plant must cover four key components.6. The learner's description of the maintenance of plant and equipment used in activated sludge treatment must cover five examples of planned preventative maintenance, including calibration.7. The learner must provide at least four examples of the waste water industry design criteria applied to activated



sludge treatment.

8. The **principles of operation** of the activated sludge treatment process must include:
 - (a) fundamental process requirements and control parameters
 - (b) Dissolved Oxygen concentration (DO)
 - (c) Feed to Mass ratio (f/m)
 - (d) Mean Cell Residence Time (MCRT)
 - (e) Retention Time (RT).
9. The **process control systems** must include:
 - (a) Dissolved Oxygen concentration (DO)
 - (b) Surplus Activated Sludge (SAS) and Return Activated Sludge (RAS) rate and concentration.
10. The learner's description of **technical terminology and units of measurement** must cover four measurements, and include control parameters for Feed to Mass ratio (f/m) or Mean Cell Residence Time (MCRT).
11. The learner must describe the **measurement** of the settling characteristics of mixed liquor by comparing two different methods used.
12. The learner must identify four root **causes of bulking** and three groups of organisms.
13. The learner's description of methods used to prevent and control bulking must include two examples for prevention and two examples for control.
14. The learner must calculate five examples of **final settlement loadings** including:
 - (a) solids flux
 - (b) upward flow velocity
 - (c) retention time
 - (d) surface loading
 - (e) weir overflow rate.
15. The learner must give three examples of **process variations** using the activated sludge process.
16. The learner must evaluate **process variations** using the activated sludge process by comparing two examples.
17. The learner's description of **nutrient removal processes** must include:
 - (a) two examples of chemical nutrient removal



	<p>processes</p> <p>(b) two examples of biological nutrient removal processes.</p> <p>18. The learner must provide a description of five examples of failure modes and common faults with activated sludge plants and other advanced waste water treatment processes.</p> <p>19. The learner must identify and explain how to rectify four examples of faults causing poor effluent quality from activated sludge plants, including root cause and remediation.</p> <p>20. The learner must analyse process diagnostic data to identify the root cause for five examples of given data sets.</p> <p>21. In evaluating process solutions to achieve compliance, the learner must cover three examples, and must rank process solutions for give performance criteria.</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