

Anaerobic Digestion

Learning Outcome	Assessment Criteria	Source
1. Understand how waste is received or rejected at an anaerobic digestion facility	1.1 Describe the procedures for waste reception, including waste inspection and identification	https://www.daera-ni.gov.uk/sites/default/files/publications/doe/waste-guidance-rps-operating-an-ad-plant-2016.pdf
	1.2 List the waste reception records kept	https://www.netregs.org.uk/environmental-topics/waste/storage-handling-and-transport-of-waste/receiving-waste-or-sewage/
	1.3 Describe the procedures for rejection of waste	https://www.daera-ni.gov.uk/sites/default/files/publications/doe/duty-of-care-code-of-practice-june2016.pdf
	1.4 Describe the requirements for waste storage at an anaerobic digestion facility	https://wrap.org.uk/sites/default/files/2021-03/PAS110_2014.pdf
	1.5 Describe how to manage food waste packaging on site	https://www.daera-ni.gov.uk/sites/default/files/publications/doe/waste-guidance-consigning-hazardous-waste-2015.pdf Animal by-product categories, site approval, hygiene and disposal - GOV.UK (www.gov.uk) Waste Treatment Eippcb (europa.eu) Anaerobic Digestion Quality Protocol https://www.daera-ni.gov.uk/articles/animal-by-products-specific-guidance Further specific guidance: Composting and biogas in approved plants for industry Department of Agriculture, Environment and Rural Affairs (daera-ni.gov.uk) DAERA guidance on composting and anaerobic digestion Department of Agriculture, Environment and Rural Affairs (daera-ni.gov.uk) Alternative transformation parameters Department of Agriculture, Environment and Rural Affairs (daera-ni.gov.uk) Guidance on hub and pod anaerobic digestion Department of Agriculture, Environment and Rural Affairs (daera-ni.gov.uk)



		<p>Guidance on the storage of compost and/or digestate (from approved ABP plants) at premises other than the premises of production or use Department of Agriculture, Environment and Rural Affairs (daera-ni.gov.uk)</p> <p>Home and small site composters and anaerobic digestion (AD) plants Department of Agriculture, Environment and Rural Affairs (daera-ni.gov.uk)</p> <p>Manure Department of Agriculture, Environment and Rural Affairs (daera-ni.gov.uk)</p>
2. Understand how different feedstocks can impact the anaerobic digestion process	2.1 State the types of feedstocks available for anaerobic digestion	<p>https://wrap.org.uk/sites/default/files/2021-03/PAS110_2014.pdf</p> <p>Waste Treatment Eippcb (europa.eu)</p> <p>Anaerobic Digestion Quality Protocol</p>
	2.2 List the characteristics that should be tested as part of a detailed feedstock characterisation	
	2.3 Describe the consequences of using contaminated feedstocks for anaerobic digestion	
	2.4 Describe how residual wastes from an anaerobic digestion facility should be: <ul style="list-style-type: none"> - Controlled - Managed - Disposed of 	
3. Understand the requirements for anaerobic digestion facilities that accept animal by-products	3.1 Describe the requirements for handling materials covered by Animal By Product Regulations (including record keeping)	<p>https://www.daera-ni.gov.uk/publications/daera-guidance-composting-and-anaerobic-digestion</p> <p>https://www.daera-ni.gov.uk/articles/animal-by-products-specific-guidance</p> <p>https://www.daera-ni.gov.uk/topics/animal-health-and-welfare/animal-products</p>
	3.2 Describe what is required for sampling and testing of pathogens when dealing with Animal By-Products	



4. Understand how to manage emissions from anaerobic digestion facilities	4.1 Describe the requirements for controlling: <ul style="list-style-type: none"> - Odour - Noise and vibration - Dust - Emissions to surface water, groundwater, and the sewer relevant to an AD facility - Bioaerosols 	https://www.netregs.org.uk/environmental-topics/nuisances/noise-odour-and-other-nuisances/odour-dust-and-smoke-nuisances/Waste Treatment Eippcb (europa.eu)
	4.2 State when fugitive emissions to air are likely to occur	
	4.3 Describe the main methods for preventing fugitive emissions to air	
	4.4 List the factors that determine the degree of odour pollution	
	4.5 State the options for odour monitoring	
	4.6 Describe the methods used to prevent and minimise the impact of odour pollution	
	4.7 Describe the information that should be included in an odour management plan	
	4.8 Describe the maintenance and checks that should be carried out to prevent emissions	
5. Understand the standards outputs of the anaerobic digestion process must meet	5.1 State what is required to ensure that an output may be used as a non-waste material	Anaerobic Digestion Quality Protocol BSI PAS 110: Producing Quality Anaerobic Digestate WRAP https://wrap.org.uk/sites/default/files/2021-03/PAS110_2014.pdf
	5.2 Outline the key principles of PAS110	



	<p>5.3 Describe the following requirements of PAS110 for:</p> <ul style="list-style-type: none"> - Feedstock - Treatment - Sampling and testing of pathogens <p>5.4 Describe the limitations and legislative compliance requirements if outputs are not certified as meeting PAS110 and the Anaerobic Digestion Quality Protocol</p> <p>5.5 Describe what wastes (including biodegradable plastics) are permitted to comply with PAS110 and the AD Quality Protocol</p> <p>5.6 List the records that need to be kept to comply with PAS110 and the Quality Protocol</p> <p>5.7 Outline the key principles of a Hazard Analysis Critical Control Point plan</p>	
<p>6. Understand the key principles of the anaerobic digestion process</p>	<p>6.1 Describe the principles of anaerobic digestion</p> <p>6.2 Describe the pre-treatment that may be requirements for different types of feedstocks</p> <p>6.3 Define the term organic loading rate</p> <p>6.4 Describe how the following can affect the stabilisation, efficiency, and biogas production of an AD plant:</p> <ul style="list-style-type: none"> - Organic loading rates - Hydraulic loading rates - Hydraulic retention time (HRT) <p>6.5 List the factors that need to be monitored during anaerobic digestion</p>	<p>https://www.netregs.org.uk/environmental-topics/waste/waste-treatment-processes/anaerobic-digestion/</p> <p>Best available techniques (BAT) reference document for waste treatment - Publications Office of the EU (europa.eu)</p> <p>Waste Treatment Eippcb (europa.eu)</p> <p>https://wrap.org.uk/sites/default/files/2021-03/PAS110_2014.pdf</p> <p>Biological waste treatment: appropriate measures for permitted facilities - 8. Waste treatment - Guidance - GOV.UK (www.gov.uk)</p>



	6.6 State the pH range for feedstock and how to manage it	
	6.7 State the consequences of having too much nitrogen within anaerobic digestion	
	6.8 Outline the requirements for pasteurisation	
	6.9 Describe the process requirements that need to be managed in case of plant and equipment breakdown	
7. Understand the requirements for sampling, testing, and storing digestate	7.1 Describe the requirements for the storage of digestate	https://eippcb.jrc.ec.europa.eu/reference/waste-treatment-0426765_EA_QP_Anaerobic_Digestate_web.pdf publishing.service.gov.uk Biological waste treatment: appropriate measures for permitted facilities - 9. Outputs - Guidance - GOV.UK (www.gov.uk) PAS110 2014.pdf (wrap.org.uk) https://www.daera-ni.gov.uk/sites/default/files/publications/doe/waste-guidance-rps-regulation-anaerobic-digestion-waste-2016.pdf https://www.daera-ni.gov.uk/publications/regulatory-position-statement-anaerobic-digestion-agricultural-manure-and-slurry
	7.2 Outline when digestate sampling and testing may be required	
	7.3 Describe the digestate treatments that may be required (including their benefits and uses)	
	7.4 Describe the legal requirements for using digestate that does not meet the PAS110 and the Anaerobic Digestion Quality Protocol	
8. Understand the key principles of biogas treatment and storage	8.1 Describe the requirements for biogas treatment	https://eippcb.jrc.ec.europa.eu/reference/waste-treatment-0426765_EA_QP_Anaerobic_Digestate_web.pdf https://www.legislation.gov.uk/nisr/1997/195/contents/made Biological waste treatment: appropriate measures for permitted facilities - 8. Waste treatment - Guidance - GOV.UK (www.gov.uk) A guide to the Gas Safety (Management) Regulations 1996. Guidance on Regulations - L80 (hse.gov.uk) A guide to the Gas Safety (Management) Regulations 1996 Guidance on Regulations (hse.gov.uk) https://www.daera-ni.gov.uk/publications/regulatory-position-statement-operating-anaerobic-digester
	8.2 Describe the requirements for biogas storage	
	8.3 Describe the options for disposal of biogas condensate	
	8.4 State the regulations for gas quality which must be complied with when injecting to the gas grid	
	8.5 Outline the requirements for using an auxiliary flare	



	<p>8.6 Describe the standard all equipment in contact with biogas should be certified to</p>	<p>https://www.hseni.gov.uk/publications/l138-dangerous-substances-and-explosive-atmospheres-gb-acop-approved-use-ni The Dangerous Substances and Explosive Atmospheres Regulations 2002 - Fire and explosion (hse.gov.uk) L138 Dangerous substances and explosive atmospheres - GB ACOP approved for use in NI Health and Safety Executive for Northern Ireland (hseni.gov.uk) Electricity in potentially explosive locations FAQs - Electrical safety at work (hse.gov.uk) https://www.hseni.gov.uk/news/gas-safety-management-regulations-ni-1997-class-exemption Regulatory Position Statement - Operating an anaerobic digester Department of Agriculture, Environment and Rural Affairs (daera-ni.gov.uk)</p>
<p>9. Understand the main causes of accidents at anaerobic digestion facilities and how to prevent them</p>	<p>9.1 Identify the causes of accidents on an anaerobic digestion facility 9.2 Identify the methods used to prevent accidents on an anaerobic digestion facility</p>	<p>https://www.hseni.gov.uk/topic/confined-spaces HSE – Confined Spaces(published 01/13) Waste Treatment Eippcb (europa.eu) https://www.netregs.org.uk/media/1436/gpp-21-final.pdf https://www.netregs.org.uk/media/kawhpi0f/gpp-1.pdf</p>
<p>10. Understand how to deal with complaints</p>	<p>10.1 Describe the actions that should be taken if a member of staff or the public identify a potential area of non-compliance or make a complaint</p>	<p>https://www.netregs.org.uk/environmental-topics/nuisances/noise-odour-and-other-nuisances/good-practice-to-avoid-causing-nuisance/</p>

