Advice Sheet 27: Anaerobic Digestion: PAS110

Introduction

The following information has been taken from the BSI PAS110 document and the ADRF (Anaerobic Digestate Resource Framework):

Well managed, anaerobic digestion (AD) systems are capable of conferring multiple environmental and socio-economic benefits. AD is an important technology for the local recovery of source segregated biowastes, especially those that arise as liquids and the more putrescible fractions of solid biowastes. The biogas they produce can be converted into energy to meet the needs of the AD system itself, for local use, for supply as electricity to the national grid or for processing into biofuel for vehicles.

The whole digestate (WD), separated liquor (SL) and separated fibre (SF) outputs that AD systems can produce have significant fertilizer value and can return useful amounts of organic matter to soils. Such digested materials are particularly suitable for maintaining and improving soil fertility of function. Benefits of these kinds can affect particular value in agriculture, soil-grown horticulture (field and some covered crops grown in soil), forestry, land restoration, land reclamation and land remediation applications.

The whole process of AD and the controlled application of digested materials reduce the environmental impact of manures and biowaste streams by lowering methane emissions and controlling odours. Such applications have the potential to reduce nitrogen losses to groundwater, surface water and to the atmosphere.

The volume of digested materials is set to increase significantly as industry responds to the latest strategies on the nations of the UK for diverting biowastes from landfill and to other policy initiatives and measures geared to develop the supply of renewable energy, tackling climate change and protecting soils.

PAS110 and its associated Resource Framework have been developed to clarify the point at which the digestate has ceased to be a waste, thus waste management controls are no longer required AND provide producers and users with confidence that the digestate is fit for purpose. The PAS (Publicly Available Specification) details control on input materials, the quality management systems that should be in place for the process of anaerobic digestion and associated technologies, and the minimum quality of whole digestate, separated liquor and separated fibre. The RF dictates that the quality digestate will become waste again and subject to waste management controls if it is stored indefinitely with little or no prospect of being used or it is disposed of.

NRM provide an analytical testing service for AD operators to ensure that their digestate is compliant with the specifications as laid down in the PAS110.

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Technical Information

Sending us samples

As a REAL Biofertiliser Certification Scheme (BCS) Approved Laboratory, NRM needs to ensure compliance with the T&Cs associated with the scheme. In order to do this, we endeavour to ensure our customers understand what is required to keep samples compliant.

This includes:

- Sample requirements
- Timescales
- Transit conditions and requirements
- Paperwork accompanying the samples
- Collation of data for REAL

To aid us in this, a customer acknowledgement form should be filled in so that we have decisions on file prior to any issues which will ensure samples should not be delayed in the event of any communication being required. Please contact **enquiries@nrm.uk.com** for details of this.

Sample requirements

To ensure that a representative sample is taken and that all analysis can be carried out, it is important that sufficient sample is sent. Please see Table 1 for information on the quantities required for different analysis.

Timescales

Timescales of Sample Dispatch by Producer

To minimise changes to the characteristics of the sample over time, it is important that samples are stored correctly and sent to the laboratory within certain timescales.

- The Digestate/Compost producer should endeavour to send samples to the laboratory on the same working day after the sample was taken.
- The Digestate/Compost producer should use a service that will deliver the sample to the laboratory within 24 hours if pathogen testing is required, otherwise a 48-hour service is sufficient. Exceptions include sites located at extreme geographical locations where a 48-hour service is the only viable option. In this instance samples MUST be dispatched on the same day as sampling.
- We are encouraging customers to only request courier collections on Monday, Tuesday and Wednesday to maximise the chance that these strict timescales are adhered to.

If the producer has not sent the samples within the correct timescales (as deduced by NRM from the producer's entry on the sample submission form) NRM should already have in writing the agreed course of action.

If the producer has chosen to cancel the testing, an administration fee will be applied to cover the cost of the courier, kit dispatch and administration.

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Sample Transit timescales

If the sample is delayed in transit NRM should already have in writing the agreed course of action.

Please note: the process of transporting the sample from site to laboratory is a joint venture between both parties. NRM will not have any liability whatsoever in relation to third party courier services.

Transit conditions and requirements

- Samples must be delivered to the laboratory in a cool box with ice packs.
- The container used for transportation must be air-tight and protect the sample from contamination.
- Animal By-Product (ABP) derived Digestates & Composts must be transported using an AB117 registered courier. Therefore, when logging a collection request with us you will be asked if your sample falls within this category. This will enable us to select the appropriate courier service.
- ABP coolboxes should be labelled 'Cat 3 ABP samples for diagnostic purposes – not for human consumption'.

Coolboxes and labels are available from our Stores department.

Please call **01344 899030**, order via our website **www.cawood.co.uk/nrm** or request by email **stores@nrm.uk.com**.

Paperwork accompanying the samples

Samples must be accompanied by the current version of the Digestate Analysis Request Form which is correctly completed. This includes the certification code - REAL should be contacted for a certification code by applicants if this is not known.

Analysis request forms are available from the scheme website: **https://www.biofertiliser.org.uk/certification/laboratories**. **The form must not be modified in any way.**

NRM will inform the producer if the correct request form has not been provided or is only partially completed but will not delay testing if no clarification is needed as to what testing is required. However, the associated results **will not be reported** until the fully completed Analysis Request Form has been supplied.

Collation of data for REAL

NRM is obliged to supply all PAS110 test results for certification purposes to the BCS database maintained by REAL. This data is not supplied in an anonymous format.

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Table 1 - NRM Suites of analysis for the PAS110

NRM Package Code/ Analysis Code	Analysis Description	Amount of Sample Required
I104	PAS110 for Anaerobic Digestate - Includes ABP Salmonella, E. coli, Potentially Toxic Elements, Total Nitrogen, Potassium, Phosphorus, Ammoniacal Nitrogen in KCl, Water Soluble Chloride and Sodium with Dry Matter and Volatile Solids and Sulphur	1 x 1 litre + 1 x 500ml sample bottles for liquid samples 1kg for fibre samples
4778	Contaminants in Anaerobic Digestate	1 litre sample bottle for liquid samples 1kg for fibre samples
4745	VFA screening test	Requirement included within RBP sample (1 Litre sample bottle if no RBP required)
4746	Residual Biogas Potential (RBP)	2 litre sample bottle for liquid samples 2kg for fibre samples

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Table 2 - Minimum digested material testing and quality requirements

Parameter	Upper Limit and Unit										
Pathogens (human and animal indicator species) in WD / SL / SF											
ABP digestate: human and animal pathogen indicator species	As specified by the competent authority / Animal Health vet / Veterinary Service vet in the 'approval in principal' or 'full approval'										
Non-ABP digestate: E. coli	1000 CFU / g fresh matter										
Non-ABP digestate: Salmonella spp	Absent in 25 g fresh matter										
Potentially Toxic Elements in WD / SL / SF											
Liquid (≤15% TS) digestates	Declare on a fresh weight basis										
Fibre (>15% TS) digestates											
Total Nitrogen (N)	**kg/t**	**<1**	**1 to 1.9**	**2 to 2.9**	**3 to 3.9**	**4 to 4.9**	**5 to 5.9**	**6 to 6.9**	**7 to 7.9**	**8 to 8.9**	**9≥**
Cadmium (Cd)	mg/kg	0.12	0.24	0.36	0.48	0.60	0.72	0.84	0.96	1.08	1.2
Chromium (Cr)	mg/kg	8	16	24	32	40	48	56	64	72	80
Copper (Cu)	mg/kg	16	32	48	64	80	96	112	128	144	160
Mercury (Hg)	mg/kg	0.08	0.16	0.24	0.32	0.40	0.48	0.56	0.64	0.72	0.80
Nickel (Ni)	mg/kg	4	8	12	16	20	24	28	32	36	40
Lead (Pb)	mg/kg	16	32	48	64	80	96	112	128	144	160
Zinc (Zn)	mg/kg	32	64	96	128	160	192	224	256	288	320
Stability of WD / SL / SF											
Volatile Fatty Acids	Screening value: 0.774 g COD / g VS										
Residual Biogas Potential	0.45 l biogas/ g VS										
Physical contaminants in WD / SL / SF											
Total glass, metal, plastic and any 'other' non-stone, man made fragments >2 mm	Declare on a fresh weight basis										
Stones >5 mm											
Total Nitrogen (N)	**kg/t**	**<1**	**1 to 1.9**	**2 to 2.9**	**3 to 3.9**	**4 to 4.9**	**5 to 5.9**	**6 to 6.9**	**7 to 7.9**	**8 to 8.9**	**9≥**
Total Stones	kg/t	3.2	6.4	9.6	12.8	16	19.2	22.4	25.6	28.8	32
Plastics*	kg/t	0.003	0.006	0.009	0.011	0.014	0.018	0.020	0.023	0.026	0.029
Total physical contaminants (excluding stones)	kg/t	0.04	0.07	0.11	0.14	0.18	0.22	0.25	0.29	0.32	0.36

No “sharps” (Detailed in Note 6.1 of PAS110:2014)

* Since 20th October 2025, all test reports now have plastic results reported against the specific plastic limit in the end of waste positions in effect in England (AD Resource Framework), Scotland (WAS-G-DEF-07) and Wales (GN-022) which are 8% of the ‘total physical contaminants (excluding stones)’ limits in Table 2.

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The current BSI PAS 110 Physical Contaminant limits (without the specific plastic limit) now only applies in Northern Ireland or processes in England with an Environment Agency Regulatory Position Statement (RPS317) exemption (valid till August 2027), and processes in Wales operating under the Natural Resources Wales Regulatory Statement 122 (RS122) exemption (valid till December 2026). Please check the BCS website for all nation-specific end of waste positions here: https://www.biofertiliser.org.uk/certification/end-of-waste-positions.

Actions in the event of a test failure

When a sample of WD or SL taken from the storage tank fails a test, if the producer chooses to take corrective action, an additional portion of digested material that has completed the minimum retention time in the digester may be pumped into the tank. After mixing, a sample representative of the tanks content may be sampled for testing. The test results are allowed to be used for process validation or if the failure occurred after validation, the results will be allowed to be used to demonstrate the continued efficacy of the production process.

However, if a sample of Separated Fibre (SF) fails to comply with the PAS110 minimum quality 3 scenarios may result.

1. Batch is dispatched as a non-PAS110 material
2. Corrective action is undertaken on the portion of product that failed and then re-sampled before any other portion is added to it
3. Corrective action is not undertaken on the portion of production that failed, and one or more additional portions of production are added to the pile and then a representative sample of the entire pile is tested.

For scenarios 2 and 3 if the test type was Residual Biogas Potential (RBP) or the pathogen indicator species (e.g. Salmonella or E. coli) these results are not allowed to be used for process validation or as part of the evidence necessary for demonstrating a valid production process. BUT these test results can be used when deciding whether that portion of production is eligible to be dispatched as a PAS110 conforming batch. However, for the test types Potentially Toxic Elements (PTE's), Physical Contaminants and stones, these results are allowed to be used for process validation or as part of the evidence necessary for demonstrating a valid production process. The reason for this restriction for the RBP and the pathogen indicator species tests are those characteristics of the sampled portion will have changed as either a result of the corrective action, or due to the addition of one or more portions, so this portion is no longer typical of routine production.

Please note that regardless of if the sample is a WD, SL or SF which has had corrective action, additional portions added to it or not, for each parameter in table overleaf, for both pre and post validation, the 3 most recent digested materials should not exceed the corresponding upper limit.

The only exception to the '3 most recent' requirement is for WD, SL & SF derived from Animal By Products (ABPs) where its quality in terms of pathogen indicator species has been validated by the competent authority/Animal Health Vet and the sample has been taken in accordance with the PAS110.

** Metals in Whole Digestate or Separated Liquor

If necessary WD and SL may utilize exemption provisions in a number of clauses in the PAS110 which essentially stipulates that the digestate will still comply to the standard if the soil to which the WD/SL is applied does not receive more than the maximum permissible annual average rate of PTE addition over a 10 year period, as specified in the Code of Practice for Agricultural Use of Sewage Sludge AND shall not exceed any soil PTE concentration as specified in the same code. Please refer to PAS110 for finer details.

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