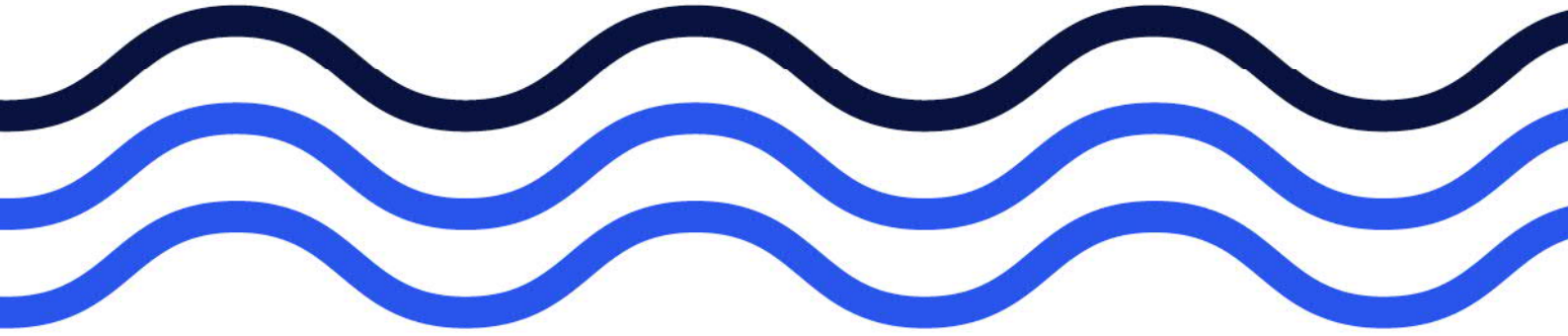
Waste pre-acceptance, acceptance and rejection Procedure for Anaerobic Digestion



YorkshireWater

Document Control

Document Control Ref:	V001
Document Location:	YW IMS (Environment and Waste > Waste and Installations > IED)
Document Custodian:	David Shaw
Review Period:	Every 12 months or sooner if: - the waste changes - the process giving rise to the waste changes - if waste is found to be non-compliant.

Document Approval

Name	**Name**
David Shaw Policy and Assurance	
Document Owner (Author)	**Document Approval Manager (Tier 3)**

Document Revision History

Version	Date	Revised By	Reviewed By	Amendment Details
1	20/12/2023	David Shaw	Hazel Morgan	New document
2				
3				

Business areas affected by this document
This applies to colleagues that are operating an IED STF or colleagues moving sludge on behalf of Yorkshire Water (YW) into a YW Anaerobic Digestion (AD) Site. It may also be applicable to any YW colleague that wants to export an abnormal sludge load into an IED AD facility.

1. Introduction

This document details the waste pre-acceptance, acceptance and rejection procedures for wastes received for anaerobic digestion (AD) at the Sludge Treatment Facility (STF) located at Yorkshire Water (YW).

This details how YW has established procedures that align with the guidance in the Best Available Techniques Reference (BREF) Document for Waste Treatment, for operational techniques to improve environmental performance.

This procedure is written using guidance produced by the Environment Agency on 'Biological waste treatment: Appropriate measures for permitted facilities' (September 2022).

1.1. Waste steams treated by AD

The YW AD facility treats only sewage sludges arising from YW waste water treatment works (WwTW). These non-hazardous waste water sludges arrive at the AD facility via two routes:

- ***Indigenous sludges***. Originating from the adjacent wastewater treatment works (WwTW) on the wider YW site and transferred to the AD facility via above or below ground pipes as liquid sludge.
- ***Imported sludges***. Arriving via sludge tanker from smaller WwTWs that have limited or no capacity for AD treatment. Imported sludges arrive as either liquid (typically 2-6%dry solids) or as cake (typically >16% dry solids).

No commercial waste will be treated at the facility.

The only wastes that will be accepted for AD will be the EWC code wastes listed in the environmental permit in schedule 2, table 2.2, reproduced in table 1 below.

19	**Wastes from waste management facilities, off-site waste water treatment plants and the preparation of water intended for human consumption and water for industrial use**
19 02	**wastes from physico/chemical treatments of waste (including dechromatation, decyanidation, neutralisation)**
19 02 06	sludges from physico/chemical treatment other than those mentioned in 19 02 05 (sewage sludge only)
19 08	
19 06 06	digestate from anaerobic treatment of animal and vegetable waste (sewage sludge only)
19 08	**wastes from waste water treatment plants not otherwise specified**
19 08 05	sludges from treatment of urban waste water

Table 1 –Permitted wastes

Table 2 provides a summary of the wastes accepted at the AD facility by waste stream, EWC code and origin.

Waste Stream	EWC code	Origin
Indigenous sludges	19 08 05 sludges from treatment of urban waste water	Sewage sludges arising from adjacent WwTW.
Imported sludges	19 08 05 sludges from treatment of urban waste water	Sewage sludge originating from other WwTW sites, delivered directly to the AD facility by tanker, comprising raw sludge.
	19 02 06 sludges from physico/chemical treatment other than those mentioned in 19 02 05	Thickened sludge arising from dewatering activities originating from other WwTW sites, delivered directly to the AD facility by tanker.
	19 02 06 sludges from physico/chemical treatment other than those mentioned in 19 02 05	Sludge cake that may originate from other WwTW sites and is stored on the STF cake pad as a contingency measure (Note 1). This sludge cake will require treatment at the AD facility.

Note 1: Sludge cake may need to be relocated for environmental protection reasons (e.g. flood risk to site) or if an unforeseen breakdown with the cake import facility has occurred.

Table 2 – Description of wastes

1.2. Key site personnel and responsibilities

This document details the characteristics of the sludge to be treated and confirms the conditions in which the sludge would be rejected. It is a requirement of the site permit that this document is in place and adhered to.

It is the responsibility of the Site Manager, the site Technically Competent Manager (TCM) and the Site Operators to ensure this procedure is adhered to.

1.3. Tracking system

This waste pre-acceptance and acceptance procedure is part of the YW Management System. The company's Sludge Delivery Scheduling system together with its WaSP software (for logging the delivery of sludges by individual tankers) ensures that a system is in place to track waste from the point of sludge pre-acceptance enquiry through to delivery at the AD facility.

2. Waste Pre-acceptance procedure

Waste pre-acceptance activities will be undertaken to determine if the waste is suitable for treatment at the AD facility. A risk-based approach will be undertaken to characterise the waste, assess the risks to process safety/occupational safety/the wider environment and to assess the impact of the waste stream on the AD process and outputs. These activities will take place prior to waste acceptance at the facility.

2.1. Legal suitability checks

An initial legal check will be undertaken on the waste. The waste type must be listed in the environmental permit for it to be suitable for AD. Information on the source, nature and point of origin of the waste will be obtained and verified against the permit EWC codes and the information presented in Table 2.

Only waste arising from WwTW sites will be treated by AD. Any enquiry from a commercial customer to deliver waste for treatment by AD will be rejected.

The proposed method for delivering the wastes to the STF will be assessed to determine if it complies with the YW safety procedures. Imported waste must be delivered in an appropriate tanker that can discharge safely into the sludge import tank.

If the waste is legally suitable, then further information will be requested on the potential quantities and characteristics of the waste, as described in this procedure.

2.2. Sampling procedures

YW commits to pre-acceptance testing of indigenous and imported sludge in order to determine its suitability for AD. This testing will also provide a bank of information that will enable YW to monitor the consistency and variability of waste from different origins.

Indigenous sludges are generally fresher in age than imported sludges. The age of indigenous sludge ranges from a few hours old up to 10 days in normal operation. Imported sludges are generally anywhere from 1 day – 6 months for the smallest WwTW sites. The sludge age is important as it can lower the sludge calorific value and affect digester health and in turn the amount of biogas that is generated. It is worth noting that smaller sites, which have a relatively older sludge age, will produce a much smaller quantity of sludge than larger WwTWs and have a lesser impact on digester health.

A representative sample of sludge will be collected for testing. The following information will be recorded for each sludge sample:

- Origin of waste – indigenous or imported, including the name of the originating WwTW
- EWC code/method of production – filter works, activated sludge, thickened sludge
- Size of sample
- Age of the sludge sampled
- Date of sample

An STF typically accepts sludge from ~100 smaller WwTW. The sludge is deemed to be consistent and therefore samples for waste characterisation will be carried out on a risk-based approach.

Sludge samples will be taken from a minimum of 10 of the 100 exporting sites. These will be selected on a risk basis and shall include sites that:

- Are the largest contributors of sludge (by volume)
- Have industrial customers within their catchment whose effluent could contain compounds with potential to disrupt/impact AD biology.

These sites would have the greatest potential to negatively impact on AD operations and therefore it is important to understand their waste characteristics.

The sampling will be undertaken by the TCM or appropriately trained Site Operator and tested at a third-party laboratory with a documented management system accredited to EN ISO 17025.

2.3. Waste Characterisation

Information on the characteristics of the waste will be obtained prior to acceptance of the waste at the STF. These characteristics fall into four groupings:

- Visual – colour, cake or liquid
- Physical – thickness (pumpability), total solids
- Level of acidity/alkalinity - measurement of pH
- Chemical – e.g. lab test results for contamination with heavy metals

Table 3 lists the test parameters for sludge samples taken during pre-acceptance. These parameters will provide information on the consistency of the sludge, the biodegradability and alert YW to any contamination/toxicity that may cause it to be unsuitable or inhibit biological activity.

These parameters have been selected as the most relevant to sewage sludge because they have the greatest potential to impact on the digestion process and on the quality of the digestate, the end product. The selection of the testing approach and acceptable ranges/trigger points is informed by operational experience, guidance on input material testing in PAS110:2014[1] and the Inhibition Values for anaerobic processes in section 13 of the EA guidance 'Biological waste treatment: Appropriate measures for permitted facilities'.

[1] PAS 110:2014 – Specification for whole digestate, separated liquor and separated fibre derived from the anaerobic digestion of source-segregated biodegradable materials.

Parameter	Testing Standard /Approach	Acceptable Range
Colour	Qualitative testing	Within typical colour range
Particle Size distribution and physical contaminants	Qualitative testing	Evidence of rags and large contaminants will be rejected unless sludge passes through a screening system
pH value	BS EN 13037	Sewage sludge is usually slightly acidic pH hydrolysis and fermentation acido and aceto genesis – optimal pH 5-7 Methanogenesis – optimal pH7-8; operational 6.5-8.5 Typical pH range of sewage sludge 6.5-8
Total solids	BS EN 14346	WaSP system records total solids. Sludges greater than 20% dry solids have a reduced capacity for being pumped through the system.
Potentially toxic elements (PTEs) Heavy metals • chromium • zinc • copper • nickel • cadmium • lead	Various EN standards available (e.g. EN ISO 11885, EN ISO 17294-2, EN ISO 15586)	Heavy metals, if above acceptable levels, may cause a toxic effect on the digester biology.
Ammonia and total nitrogen content	EN 12260, EN ISO 11905-1	Ammonium build up may inhibit the anaerobic process No threshold data provided

Note: It is Recognised that the inhibitory values are under review and may be added, removed or amended. This table will be updated when data is available or otherwise in agreement with the Environment Agency.

Table 3 – Test parameters

This information will assist YW in understanding how each waste type would be processed, the effect of the different waste streams/sources on the AD process, in order to manage the facility more efficiently, predicting gas generation and digested sludge properties.

The likely weekly volumes, delivery frequencies and estimated annual quantities of each waste identified for AD treatment will also be recorded.

2.4. Record keeping

The pre-acceptance waste characteristics information will be obtained in writing or electronic form. All information will be stored electronically on a central database system called ROD.

The pre-acceptance records will be retained for at least 3 years using the YW computerised waste tracking systems following receipt of the waste. If an enquiry does not lead to receipt of the waste, a record does not need to be kept.

2.5. Reassessment of waste

Wastes will be reassessed should the following occur:

- There are significant changes in the waste e.g. the physical description is different to previous samples taken from the site source
- There are process changes at the WwTW that results in changes to the waste changes e.g. a different type of sludge thickening agent is used
- There are significant changes to industrial waste water sources
- The waste received does not conform to the pre-acceptance information

Irrespective of the above, an annual pre-acceptance review will be undertaken to ensure the waste sources remain suitable for AD.

2.6. Confirmation of suitability

The Site Operator, under the instruction of the TCM, will determine if the pre-acceptance information received meets the legal and technical requirements of the AD facility.

3. Acceptance

The AD facility treats only sludges arising from WwTW sites. These are known sources and the waste will be consistent in its characteristics. It's anticipated that only on rare occasions will waste need to be rejected.

In accordance with Section 6.8 of guidance produced by the Environment Agency on 'Biological waste treatment: Appropriate measures for permitted facilities' (September 2022), acceptance sampling requirements do not apply to sewage sludge and septic tank sludge. Instead, visual checks and periodic audits against pre-acceptance characteristics will be undertaken.

The following sections of this procedure detail how visual acceptance checks will be undertaken, the waste rejection process, record keeping and periodic testing.

3.1. Characteristic checks prior to tanker/tipper loading

Tankers are used to collect liquid sludges from smaller YW WwTW sites to a STF for AD. This should be consistent in colour and odour. The tanker driver will undertake a visual and / or odour check on the waste prior to loading. If the waste has a typical appearance and odour it will be loaded and delivered to the AD site.

Tipper vehicles are used to transport sludge cake from smaller YW WwTW sites to a STF for AD. Prior to loading, the tipper driver will inspect the cake to ensure it is not too wet/has high dry solids and therefore will not seep out of the vehicle onto the road. The waste will be rejected if the water content is too high or if it has weeds growing on it.

The waste will be rejected for collection if it:

- Has a darker colour than usual
- Appears to be contaminated with oil
- Has a different/unusual odour suggesting the waste is septic or has other contamination

These visual and odour checks take place prior to collection of the waste from the WwTW.

3.2. Visual and physical characteristic inspection at the STF

Waste is only received and accepted under the supervision of a suitably qualified operational team member. A visual inspection of solid feedstocks is carried out before any waste is unloaded. This will check for any unusual malodours and visual appearance differences, to confirm the waste is consistent with agreed pre-acceptance parameters.

Under normal operation, every liquid sludge waste load received on site will enter the AD import facility via a WaSP logger, a software data management system. This records the total quantity of waste and the % dry solids (total solids) in addition to the time and date on when the waste was unloaded. The system will only permit the waste to be unloaded if there is sufficient storage capacity in the holding tank. Insufficient storage capacity will cause the valve to close, which will automatically turn off the tanker pumps and unloading will cease as a result.

3.3. Storage of sludge cake

Any sludge that has failed acceptance testing and needs to be quarantined must not be stored on site for longer than 5 working days.

In exceptional operating circumstances, for example where cake import facility is unavailable due to mechanical downtime, sludge cake may be imported onto the cake pad awaiting further processing through the AD. Any imported cake must be stored appropriately so as not to cause a contamination risk to any digested sludge piles or an amenity impact.

3.4. Rejection of waste in import tank

Sludge that does not meet the agreed quality criteria must not enter AD treatment. Through the visual inspection process, early identification of issues should eliminate problems. However, imported liquid and sludge cake are soon fed into the process. Any problem not identified at visual inspection stage may have entered the process by the time a problem has been identified. If this occurs the following steps will be undertaken:

1- Waste will be isolated in the tank
2- A tanker will couple up to the appropriate tank and empty it of its contents
3- No further imports will be accepted whilst this emptying is occurring

4- The tank will not be put back in service until all contents are removed. Only at this point will the site be open to imports

3.5. Treatment of septic sludges

Treating a high load of septic sludges can cause increased foaming, reduce biogas yield and produce more carbon dioxide and hydrogen sulphide. In addition, sludges may be higher in metal concentration due to evaporation of sludges, which can be toxic to the digester bacteria causing rapid bacterial poisoning and a reduction in biogas yield. Sludges may be outside of a normal pH range, a shock impact of which could affect digester health and impact biogas yield.

Sludges that are septic in nature, and where the load is deemed significant, will be subject to testing prior to acceptance at the AD import facility. A sample of the waste must be taken before it has left the exporting site and the results submitted to the TCM for review*. The results will be used in a digester toxicity calculator to determine the correct course of action. The possible outcome of this toxicity analysis are as follows:

- Acceptance of the sludge at the requested site
- Acceptance of the sludge at another YW AD site (where the toxicity calculator demonstrates there will be no issue to digester health)
- Reduced load acceptance at the requested site (i.e. part load acceptance to enable blending with normal sludges)
- Acceptance of load over a longer period of time
- Combination of the above
- Rejection of the sludge in its entirety and another outlet (i.e. landfill) to be found**

* At minimum, Sludges will be tested for the following… pH, volatile solids concentration, ammonia, potential toxic elements (PTEs).

**Sludge will be rejected if a reduction in the sludge load and / or increase of import time makes no difference to the waste's toxicity and it continues to fail toxicity limits.

Rejected loads will be sent to a suitable facility for processing and any records of the decision to reject abnormal loads and the associated digester toxicity calculation will be kept for no less than 3 years.

3.6. Waste tracking

All Imported sludge loads are tracked through the WaSP import facility. In the event of an issue arising with digester health, the WaSP system can be interrogated to identify the sludge origin. The outcome of any investigation will be to minimise the reoccurrence of an issue arising in the future.

3.7. Periodic sampling

Testing will be carried out on the parameters listed in table 3 when a problem with a waste source has been identified at the STF or if the waste may have changed in characteristic as detailed in section 2.5. Sampling and inspection may only be carried out by operators with appropriate technical knowledge to identify and deal with non-conforming feedstocks.

This test results will be used to ensure the waste characterisation in section 2 remains accurate.

4. Definitions

Definitions of Terms Used:	
Yorkshire Water	Yorkshire Water is used in this document to refer to Yorkshire Water Services Limited and all other subsidiary companies within Kelda Holdings.
Anaerobic Digestion	AD is used to refer to anaerobic digestion. The process which imported waste is subject to at this sewage treatment facility.

5. Compliance with this document

Colleagues shall comply with the requirements of this document, in line with the company Conduct Policy.

6. Assurance

Regular monitoring of compliance with these requirements shall be undertaken by the assurance providers documented as part of the Assurance Framework.

Any sampling that is undertaken will be taken in accordance with sampling procedures as documented in the internal guidance document Operator Self-Monitoring, which can be found on the Integrated Management System. Samples must be tested at a UKAS accredited laboratory.

7. Related Documents