Water company queries on the Biological Waste Treatment Appropriate Measures 4th October 2022

To enable a transparent submission under the PR24 WINEP sludge drivers, water companies have several questions about the Biowaste Appropriate Measure Guidance. This document is split into 1) questions relating to the WINEP submission and 2) questions relating to other waste permitting issues.

Black text is taken from the Appropriate Measures
Blue text is the water industry question and or comment
Red text is the EA response.

1) Questions relating to the WINEP submission

General points

1. 'Digestate' is referenced throughout without a definition and seems to be used an overarching term. This needs to be defined as consequences for covering all digested cake is significant/impossible. Digestate refers to the output from a digester. It can be whole digestate or it may be separated into liquid digestate and fibre or cake. The term includes digested sewage sludge which is simply a specific type of digested material. Sludge cake is the partially dewatered fraction of sewage sludge and is normally stackable. For the purpose of this discussion the EA believe there is no need to further make distinctions. However, we will review this in further amendments.

2. Risk assessments are occasionally referenced in the document in relation to H&S but then the bullet points are all "you must…". Are these rules absolute or can they be risk assessed out? It seems like the only options are covers or barns, not open cake storage (We haven't ruled out open cake storage entirely. it depends on how stable the cake is and its residual biogas potential. The sludge regulations define 'treated sludge' as sludge which has undergone biological, chemical or heat treatment, long-term storage or any other appropriate process so as significantly to reduce its fermentability and the health hazards resulting from its use. If sludges are exhibiting high levels of fermentability they should not be being dispatched for use under the SUiAR anyway. Recent research suggests that since untransformed VFAs partition into the solid fraction, the RBP of the cake remains high in digestates where the digestion process has been shortened. The degree of digestion and thus methane emissions from cake is likely to depend upon the available volume of the digester, the feed rate, the retention time, and the efficiency of the digester). The responsibility then is on the water industry to demonstrate that the sludge can be storage in the open with no or minimal adverse effects. We would need to consider DSEAR risk and would avoid putting raw cake in buildings as the environment created is not suitable for a working environment, would corrode and increase risk of odour escape. This causes me some concern. Is this a recognition that cake does emit substances which would justify containment? If the cake is so unstable and levels of residual biogas potential so high then it is a matter of concern that the digestion process is so ineffective and produces sludge to such a minimal standard.

Section 1 of the guidance states that not all measures may not be suitable for or relevant to a particular operation. Clearly 'must' does not apply in these instances but we do expect operators to demonstrate, using evidence, that a measure is not relevant. For example it may be claimed that it is not necessary to cover a pile of sludge cake, but we expect this to be backed up by evidence that emissions from fresh sludge cake are so low that they do not justify covering (see also my comments above)

The guidance also provides flexibility by allowing operators to propose alternative measures where they can be shown, with evidence, to achieve the same level of environmental protection. Evidence based risk assessment can be used to demonstrate equivalence and inform decision making. There is a difference between (a) using a risk assessment to demonstrate an alternative form of engineered containment to that in CIRIA 736 provides similar protection, and (b) giving an opinion that the risk of something occurring is so low that no secondary containment is required.

HSE have been clear that it is possible to find design and engineering solutions to minimise H&S risks. "A competent installation is possible using current tank standards. If the use case is put together with a process engineer, they can specify the design conditions and tank manufacturers should be capable of modifying a tank to meet that use case and demonstrate that the installation meets the engineering standard you have chosen to use." In other words H&S is not reason enough to discount the need for containment, if a risk assessment shows a significant residual risk then the wrong solution has been chosen. If in doubt engage specialist engineers to identify the most appropriate solution.

HSE also shared the following links to its general guidance on tank standards
https://www.hse.gov.uk/comah/sragtech/techmeasplant.htm,
https://www.hse.gov.uk/pubns/priced/hsg176.pdf
And some German biogas information
Biogas Safety Reformatted Draft 1.pub (build-a-biogas-plant.com) and Biogas safety first! - Biogas Association.

Finally, BAT AELs are not negotiable and must be achieved unless a derogation has been obtained. Note that the criteria for obtaining a derogation are fixed and very rigorous and unlikely be agreed at this stage as all industry have been given ample opportunity to present data and alternative approaches.

3. Section 2, Definition of biodegradable and sewage sludge. 2.1.

States that physical treatments like dewatering or chemical treatments such as lime dosing are not included. Does this mean that post digestion dewatering, and lime treatment activities do not fall under appropriate measures? What about standalone dewatering activities on T21 exempt or waste operation permitted sites?

The key here is the distinction between biological waste treatment, i.e. biowaste treatment, and the biological treatment of waste. The title of the guidance is *"Biological*

waste treatment: appropriate measures for permitted facilities" and applies to facilities which treat biological waste.

The guidance covers all relevant aspects of the treatment facility including the actual biological treatment process and any associated activities such as pre-assessment, reception, and storage. The guidance includes generic environmental protection measures such as containment which are applicable to all waste facilities including those handling biological waste.

The quote in the question is incorrect, the guidance actually states that "Biological treatment does not include physical treatments like dewatering, mechanical separation or chemical treatments such as lime dosing". This is a simple statement of fact. It means that these treatments are not biological treatments, it does not mean that the appropriate measures don't apply to these activities, simply that they are not biological treatments.

It would subvert the intention of the appropriate measures and the waste treatment BREF if appropriate measures were deemed not to apply to aspects of a biological waste treatment facility which were not biological treatments but formed part of the overall treatment process. For installations this is dealt with by making any directly associated activity subject to BAT. Modern waste operation permits will usually have conditions which cover all non-biological aspects of a treatment process. Where the activity is conducted under a T21 exemption the relevant objectives still apply. Reference should be made to the appropriate measures guidance so that should problems arise the operator can demonstrate that they were following best practice. Even if the specific criteria for exemption are met the regulator may still intervene if the manner of operation is not consistent with meeting the relevant objectives.

4. Section 4.2 Site Design, 5.

"To prevent emissions (including ammonia) you must cover digestate stores and compost liquor. Where fixed covers are used these must have a system that can remove and effectively treat emissions". With regards to the water industry, does the term "digestate" refer to untreated sludge and /or dewatered sludge and / or digested sludge cake? To what level would emissions need to be reduced to, there are no AELs or limits specified? Digestate refers to the output from a digester in whole (unseparated) form, or as a liquid or solid (fibre) fraction. Untreated sludge, including raw dewatered sludge, is not a digestate but is still capable of producing emissions which will require managing to prevent or minimise losses. Sludge AD inputs are more volatile than many organic inputs to commercial AD plants and emissions need to be controlled in accordance with BAT.

Where it can be demonstrated that the waste being stored is unlikely to be a source of emissions to air it may be possible to justify not covering the waste. For separated digested sludge the liquid fraction is more likely to be a source of nitrogen emissions, whereas recent research shows a large proportion of volatile fatty acids is retained in the cake. Unless the cake has been well digested it is likely to continue producing methane and releasing it to air.

5. Section 6 – "7. You must not include wastes in the process solely for dilution."
Does this include applying final effluent on imported cake? We need to have this as acceptable otherwise that limits our ability to thicken and process. No the use of FE to optimise solids content prior to digestion is an acceptable technique.

6. Section 7.3 "4. Existing lagoons can use floating covers or a crust (formed where there is a high dry matter content) to manage emissions. Coverage must be sufficient to minimise the surface to air ratio to prevent emissions."
What type of lagoons does this apply to and what is the cost/benefit of this? Lagoon storage tends to be used for liquids which have low potential to generate emissions where surface covers are sufficient to significantly reduce losses of N to atmosphere. It's not clear what relevance the reference to cost/benefit has other than the benefit to health resulting from the reduced exposure to ammonia.

7. Section 7.7 Tank inspection and maintenance, 1.
Do "sludges and digestates" include any of the following - untreated sludge (yes) and /or dewatered sludge (yes) and / or digested sludge cake (yes)? And if so in Section 7.7, 7. "If you operate a new facility, you must cover tanks, vessels or lagoons that store or treat hazardous or liquid wastes with fixed covers". Does this mean any new sludge or digestate storage tank must be covered? Yes unless it can be evidenced that the substance stored will not be a source of aerial emissions including odour.

8. Section 8.2 Pre-Treatment, 4 and Section 7
"14. You must store highly putrescible wastes, including odorous and ammonia-rich wastes and wastes containing animal by-products, in a contained or enclosed building."
Definitions of "highly putrescible" are needed. Does the EA consider this to cover any of the following - untreated sludge and /or dewatered sludge and / or digested sludge cake? "Highly putrescible" takes its normal dictionary meaning i.e. highly liable to become putrid. Untreated sludge and raw dewatered sludge would certainly fall into this category. A properly stabilised digested sludge cake is unlikely to be highly putrescible, but sludges vary in their quality and composition, and it is necessary for the operator to be aware that some cake may fall into this category.
KN – we could amend the text to make it clearer, but we won't add limits or ranges. It's a living document.
Mat D – fermentability may be a clearer term for WaSCs

9. Section 9.4, Outputs from anaerobic processes – digestate. 4.
"You must effectively minimise fugitive emissions from dewatered digestate fibre and digested sewage sludge cake. This applies to all stored material. For example, you must store it:

- under a suitable cover
- in an enclosed building fitted with an air ventilation and extraction system"

We require more detail on whether a cover or a building is required. We require more detail to determine under which circumstances covered storage is required and what type of storage is deemed "suitable". Before we can give more detail it would be necessary to have some evidence on the extent to which digested sludge cake is a source of aerial emissions.

Our initial assumption was that it is not a significant source however we have since seen evidence to the contrary.

The extent to which the sludge has been digested and its stability will be a significant factor in determining whether the digestate is a potential source of aerial emissions and therefore requires covering. If the digestate is still producing methane this needs to be captured and abated. The best way of reducing the need for this is to digest the sludge for longer to extract more of the gas.

Odour is considered an aerial emission so the presence of a nearby sensitive receptor will also have some bearing on whether the sludge requires covering and/or an extraction and abatement system.

10. Section 9.4 Outputs from anaerobic processes – digestate, 4.
If digestate is the material remaining after the AD of a biodegradable feedstock. Does this one use of the specific phrase "digested sewage sludge cake" preclude sewage sludge digestate from all other references in the guidance? No

11. Section 9.4 Outputs from anaerobic processes – digestate, 16.
Can you give a definition of "untreated or unscreened digestate" given that digestion is a treatment? It's all in the context. This paragraph deals with contingency measures where the treatment technology has failed i.e. where what comes out of the digester has not received an adequate level of treatment.

12. Section, 9.4 Outputs from anaerobic processes – digestate, 1.
"You must test your digestate to confirm that it is stable and has minimal biogas potential to prevent fugitive emissions". In this context, what does stable mean? Is it to do with testing for % dry solids, volatile solids or something else? Please can you clarify what you are trying to control for example, odour, ammonia or methane emissions? What frequency are you expecting, and would we need to test against a particular standard? This forms part of the characterisation of the digestate being produced and a good indicator of the efficacy of the digestion process.

Having reviewed the recording of our MS Teams discussion we can address the points in more detail.

The requirement to produce a stable sludge is not new. Water companies have undertaken only to spread treated sludge. If a treated sludge is to be dispatched for storage, and spreading under the Sludge Use in Agriculture Regulations, then due regard must be given to the definition of treated sludge in the Regulations.

"treated sludge" means sludge or septic tank sludge which has undergone biological, chemical or heat treatment, long-term storage or any other appropriate process so as significantly to reduce its fermentability and the health hazards resulting from its use, and "untreated sludge" shall be construed accordingly; and

As Mat Davis pointed out during our discussion a helpful way of thinking of stability is to equate it to fermentability. Thus a sludge with a significantly reduced fermentability can be considered to be stable.

Next to IED. In the Emissions to Air section of the BAT conclusions BAT 14 is as follows:

BAT 14. In order to prevent or, where that is not practicable, to reduce diffuse emissions to air, in particular of dust, organic compounds and odour, BAT is to use an appropriate combination of the techniques given below.

Depending on the risk posed by the waste in terms of diffuse emissions to air, BAT 14d is especially relevant.

Technique		Description	Applicability
d.	Containment, collection and treatment of diffuse emissions	This includes techniques such as: —storing, treating and handling waste and material that may generate diffuse emissions in enclosed buildings and/or enclosed equipment (e.g. conveyor belts); —maintaining the enclosed equipment or buildings under an adequate pressure; —collecting and directing the emissions to an appropriate abatement system (see Section 6.1) via an air extraction system and/or air suction systems close to the emission sources.	The use of enclosed equipment or buildings may be restricted by safety considerations such as the risk of explosion or oxygen depletion. The use of enclosed equipment or buildings may also be constrained by the volume of waste.

"Depending on the risk posed by the waste in terms of diffuse emissions to air". This is signposting that the likelihood of the waste causing emissions to air will determine the appropriate level of mitigation. For sewage sludge this will be determined in part by the type of technology used to pre-treat and treat the sludge and the thoroughness of the treatment process.

Sludge which has undergone incomplete digestion will produce digestate with a higher residual biogas potential than a similar sludge which has been extensively digested. Research indicates that when whole digestate is separated the residual fatty acids will preferentially partition into the solid (cake) fraction whereas much of the ammonia will be retained in the liquid fraction.

The method used by PAS110 to assess stability of a digestate, OFW004-005, is based upon measurement of the residual biogas potential. Details can be found in PAS110.

The limit used in PAS110 for the End of Waste test is 0.45 litres biogas/gram volatile solids. However the basis for BAT requirements differ from those for end of waste which relies upon comparison with a non-waste equivalent. BAT requirements are focused on preventing or,

where this is not practicable, reducing diffuse emissions to air. The proposed limit for determining whether a sludge is biologically active is therefore 0.25 litres biogas/gram volatile solids.

Tanks containing sludge with a RBP greater than this limit will be considered biologically active and will need to be covered and connected to an abatement system. If the sludge has a RBP below this limit it may still be necessary to cover the tank to minimise other emissions such as ammonia or odour

2) Questions relating to other waste permitting issues

13. Section 1.3 Implementing appropriate measures at new and existing facilities, 1.
There is a 12-month deadline to comply to "low cost" items, i.e., by September 2023. We don't feel that 12 months is long enough for us, our partners do not have the resource to design and build within that timeframe. This also depends on the scope of measures we've committed to. The strict deadline for implementing BAT which was communicated to WaSCs three years ago was the waste treatment BREF deadline of 17 August 2022. The BREF and BATc have been available since 2018, and the EA has provided an enhanced level of technical support including specially arranged training sessions. The original legislation bringing biological treatment within scope of the IED gave operators 30 months to obtain a permit and achieve BAT. When the BREF deadline passed WaSCs had already had 37 months to plan and implement the improvements necessary to operate in accordance with BAT.
No applications have been received for the new SR2021 No10 standard rules. When bespoke permits are issued they will include conditions which specify the deadline for completing the implementation of any necessary improvements. These deadlines will in all cases be before the end of 2024 and no variations will be granted to extend beyond this date.

14. Section 3 "You must therefore fully characterise and assess all bespoke wastes before introducing them into a biological treatment process."
The definition of bespoke wastes needs to be clarified before we can further comment. Would untreated sludge (EWC 19 08 05) or dewatered sludge (EWC 19 02 06) be included? It is our view that these wastes should not be included as bespoke wastes. As explained in section 3 of the appropriate measures guidance bespoke wastes are those which are not included in the biowaste standard rules permits or the compost and AD quality protocols. Since both untreated sludge and dewatered sludge are listed in *SR2021 No 10: anaerobic digestion of non-hazardous sludge at a waste water treatment works, including the use of the resultant biogas* neither are considered to be bespoke wastes.

15. Section 8.9 "you must install a permanent back-up generator" on AD sites.
Is this necessary in all cases? We would need to review power contingency across the relevant permitted sites that may already have sufficient back up alternatives. Would a back-up power supply address the perceived risk here? Installing backup generation on sites would be a multi-million-pound investment. If an operator has adequate back up power in the event of a failure then that would be adequate. This would be covered by a

HAZOP assessment, which we assume would have already been undertaken to inform accident and contingency measures.

16. Section 10. The Control of Major Accident Hazard Regulations 2015 (COMAH) Example 1 & 2.

The COMAH calculations within the examples for biogas were not clear. One COMAH example is based on biogas being the higher risk level and the other in the lower risk level. Please can we have clarity on this? We have provided examples to clarify the requirements. If there is any uncertainty about whether COMAH applies you should seek advice from HSE.