

# **RBP inoculum inhibition and invalid test results**

BCS position and procedures on RBP inoculum inhibition and invalid test results

## Use of RBP test as specified in BSI PAS 110

The residual biogas potential (RBP) test is used under the BCS to assess the stability of digestates and is an important criterion for operators to demonstrate resource recovery. Digestate samples are tested in line with the BSI PAS 110 referenced method by BCS Approved Laboratories. Alongside test samples (mixed with an inoculum), controls are also run consisting of the inoculum on its own and a positive control containing inoculum plus cellulose substrate. An inoculum is required to allow for samples which have a post-digestion pasteurisation process, and otherwise to speed up the test.

## Inoculum inhibition and invalid test results

One quality control (QC) requirement of the test method is that the 'sample + inoculum' should be positive, in terms of gas production, within 5 days of starting the test. Where the 'sample + inoculum' is negative beyond 5 days, the Approved Laboratory must report an invalid test.

In such instances, the conclusion is that the inoculum has been inhibited by the nature of the digestate sample, for example, by high concentration of one or more compounds which negatively impact on the inoculum microbial community activity (and gas production). Due to this inhibition, the test is unable to clearly demonstrate digestate sample stability (*please note, this is not a test failure*).

# Properties of samples causing inhibition

Based on our current understanding, digestate samples with higher ammonium content (>3500 mg/l) are more likely to cause inoculum inhibition. Anaerobic digestion (AD) plants processing N-rich feedstocks such as poultry litter or fish waste may experience this issue. Otherwise, AD plants processing food waste generally may also cause inhibition.

## Overcoming inoculum inhibition

The full RBP test method description states that the inoculum should be from 'a mesophilic anaerobic digester treating municipal wastewater biosolids'. As such, BCS Approved Laboratories are required to use such material for RBP testing. However, elsewhere in the WRAP report which contains the RBP test method, it states 'an ideal inoculum is one that is fully acclimated to the incoming waste while also being depleted of residual primary and intermediate substrates'.

Working with several operators, we have shown that inocula taken from site is better acclimated to digestate sample chemical makeup than a laboratory's standard inoculum. Trials were carried out in parallel i.e., digestate with both site inoculum and separately with the laboratory's standard inoculum. Where a suitable (stable) site inoculum was provided to the laboratory, a valid RBP result has been reported, which supports validation/certification under the BCS.

# Procedure for operators experiencing this issue

### 1. Receiving notification of an invalid test result from the laboratory

BCS Approved Laboratories flag invalid RBP tests in/with their reports and advise operators to contact BCS. BCS Certification Bodies are also aware of the issue and actively direct operators to contact BCS.



If an operator is informed their digestate sample is causing inoculum inhibition, they should contact BCS immediately to discuss the issue. An email should be sent to <u>info@realschemes.org.uk</u>.

BCS will discuss with individual operators or their representative the feedstock composition and process parameters and any recent changes to either of these.

## 2. Parallel inoculum testing

- 1. Following discussion (and confirmation of the issue), BCS will authorise sending an alternative 'site' inoculum with a new digestate sample for 'parallel inoculum testing'. *The labs can provide further guidance/advice on suitable site inocula (these should be depleted of primary and intermediate substances i.e., fairly stable in terms of biogas production).*
- 2. Before sending a new digestate sample and site inoculum you will need an approval code from BCS for your specific AD process and output. The approval code will start 'PARA' and then have three unique letters to identify your process followed by three unique numbers e.g. PARA-XXX-000. BCS will also provide you with a unique analysis request form for testing with site inoculum the approval code should be entered onto this form.
- 3. You can now send your digestate sample, site inoculum, and correctly completed paperwork, to your chosen BCS Approved Laboratory.
- 4. Once parallel test results are obtained, you should share these with the BCS using the <u>info@realschemes.org.uk</u> email address. BCS will provide advice on the received results.
- 5. Should the site provided inoculum perform well (i.e., provide a valid test result), at least one further parallel test will be advised if you wish to use an alternative 'site' inoculum again.

Parallel test runs are required to ensure a suitable alternative inoculum can be provided by the individual site i.e., to ensure confidence in the approach for individual sites. If the laboratory's standard inoculum also generates a valid result, you may decide to continue with additional parallel inoculum tests or return to using the laboratory's standard inoculum only.

#### 3. Site inoculum only testing

To minimise the cost of parallel RBP testing for operators, BCS will authorise operators to only use a site inoculum after two successful sets of parallel test runs with the site inoculum.

Once successful parallel tests have been performed and results shared with the BCS, a different approval code will be provided. This code will start 'OWN' and then have three unique letters to identify your process and output followed by three unique numbers e.g. OWN-XXX-000.

You can now use site inoculum only for future RBP tests for the specific AD process in question.

Note: you can return to using the laboratory's standard inoculum at any time.