



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 REAL 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.

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, REAL 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. So far, trials have been 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 has been provided to the laboratory, a valid RBP result has been reported, which supports validation/certification under the BCS.

Procedure for operators experiencing this issue

REAL BCS approved laboratories flag invalid RBP tests in their reports and advise operators to contact REAL. BCS certification bodies are also aware of the issue and actively direct operators to REAL.

1. If an operator finds their digestate sample is causing inoculum inhibition, they should contact REAL immediately to discuss. An email should be sent to info@realschemes.org.uk.
2. REAL will discuss with individual operators or their representatives the feedstock composition and process parameters and any recent changes to either of these.
3. Following discussion (and confirmation of the issue), REAL will authorise sending an alternative inoculum with a digestate sample for parallel RBP 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).
4. REAL will request that completed parallel test results are shared by the operator or their representative to provide further insight into longer term management of this issue.
5. Operators wishing to adopt this approach for future tests should again contact REAL for authorisation unless otherwise indicated.

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

Future review

REAL is actively monitoring this issue and may update this external position statement based on new information or evidence.